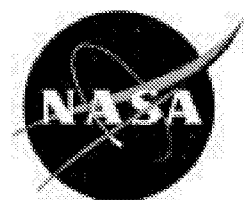


NASA/SP—2000—7037/SUPPL421
November 2000

AERONAUTICAL ENGINEERING

A CONTINUING BIBLIOGRAPHY WITH INDEXES



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02	Aerodynamics	2
	Includes aerodynamics of flight vehicles, test bodies, airframe components and combinations, wings, and control surfaces. Also includes aerodynamics of rotors, stators, fans and other elements of turbomachinery.	
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ST-1

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Typical Report Citation and Abstract

- ❶ 19970001126 NASA Langley Research Center, Hampton, VA USA
- ❷ Water Tunnel Flow Visualization Study Through Poststall of 12 Novel Planform Shapes
- ❸ Gatlin, Gregory M., NASA Langley Research Center, USA Neuhart, Dan H., Lockheed Engineering and Sciences Co., USA;
- ❹ Mar. 1996; 130p; In English
- ❺ Contract(s)/Grant(s): RTOP 505-68-70-04
- ❻ Report No(s): NASA-TM-4663; NAS 1.15:4663; L-17418; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
- ❼ To determine the flow field characteristics of 12 planform geometries, a flow visualization investigation was conducted in the Langley 16- by 24-Inch Water Tunnel. Concepts studied included flat plate representations of diamond wings, twin bodies, double wings, cutout wing configurations, and serrated forebodies. The off-surface flow patterns were identified by injecting colored dyes from the model surface into the free-stream flow. These dyes generally were injected so that the localized vortical flow patterns were visualized. Photographs were obtained for angles of attack ranging from 10° to 50°, and all investigations were conducted at a test section speed of 0.25 ft per sec. Results from the investigation indicate that the formation of strong vortices on highly swept forebodies can improve poststall lift characteristics; however, the asymmetric bursting of these vortices could produce substantial control problems. A wing cutout was found to significantly alter the position of the forebody vortex on the wing by shifting the vortex inboard. Serrated forebodies were found to effectively generate multiple vortices over the configuration. Vortices from 65° swept forebody serrations tended to roll together, while vortices from 40° swept serrations were more effective in generating additional lift caused by their more independent nature.
- ❽ Author
- ❾ *Water Tunnel Tests; Flow Visualization; Flow Distribution; Free Flow; Planforms; Wing Profiles; Aerodynamic Configurations*

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AERONAUTICAL ENGINEERING

A Continuing Bibliography (Suppl. 421)

NOVEMBER 2000

01

AERONAUTICS (GENERAL)

Includes general research topics related to manned and unmanned aircraft and the problems of flight within the Earth's atmosphere. Also includes manufacturing, maintenance, and repair of aircraft.

20000108801 Research and Technology Organization, Systems Concepts and Integration Panel, Neuilly-sur-Seine, France
Technologies for Future Precision Strike Missile Systems *Les Technologies des Futurs Systemes de Missiles Pour Frappe de Precision*

September 2000; 98p; In English, 23-24 Mar. 2000, Atlanta, GA, Turin, Ankara, USA, Italy, Turkey; See also 20000108802 through 20000108809; The CD-ROM contains full text document in PDF format

Report No.(s): RTO-EN-13; AC/323(SCI)TP/25; ISBN 92-837-1037-1; Copyright Waived; Avail: CASI; A05, Hardcopy; A02, Microfiche; C01, CD-ROM

This lecture series addressed recent advances in the state-of-the-art for precision strike missile systems. Emerging technologies that were addressed in the lecture series included: (1) Missile aeromechanics technologies- Assessments included hypersonic airframes, low cost/high temperature structure, and ramjet propulsion. (2) Guidance & control technologies- An overview of existing guidance and control was given. Assessments included precision navigation using light weight/low GPS/INS and optimal guidance laws. (3) Seeker technologies- Assessments included active and passive imaging infrared and radar seekers. (4) Missile design technologies- Assessments included computer programs and electronic spreadsheets for conceptual design. (5) Missile/aircraft integration technologies- Assessments included high firepower weapon concepts, reduced observables, and insensitive munitions. (6) Simulation/validation technologies- Assessments included hardware-in-the-loop and design validation. (7) Automatic target recognition- Assessments included robust algorithms and hardware/algorithm optimization.

Author

Lectures; Missile Systems; Missile Control; Radar Homing Missiles; Inertial Navigation; Missile Design; Target Recognition; Aerodynamics; Systems Integration

20000108879 NASA Scientific and Technical Information Facility, Baltimore-Washington International Airport, MD USA
Aeronautical Engineering: A Continuing Bibliography with Indexes, Supplement 420

October 2000; 65p; In English

Report No.(s): NASA/SP-2000-7037/SUPPL420; NAS 1.21:7037/SUPPL420; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This supplemental issue of Aeronautical Engineering, A Continuing Bibliography with Indexes (NASA/SP-2000-7037) lists reports, articles, and other documents recently announced in the NASA STI Database. The coverage includes documents on the engineering and theoretical aspects of design, construction, evaluation, testing, operation, and performance of aircraft (including aircraft engines) and associated components, equipment, and systems. It also includes research and development in aerodynamics, aeronautics, and ground support equipment for aeronautical vehicles. Each entry in the publication consists of a standard bibliographic citation accompanied, in most cases, by an abstract. Two indexes-subject and author are included after the abstract section.

CASI

Aerodynamics; Aeronautical Engineering; Bibliographies; Indexes (Documentation)

20000110545 Alaska Univ., History Dept., Fairbanks, AK USA

Closing The Door? High Speed Research at NACA/NASA

Millbrooke, Anne, Alaska Univ., USA; 1999 NASA - ODU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; August 2000, pp. 69; In English; See also 20000110509; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Speeds Gradually Increased during the early days of airplanes. In the 1920s and '30s the National Advisory Committee on Aeronautics (NACA) worked on Cowlings, Propellers, and Streamlining as factors contributing to higher Speeds. The wartime introduction of jet and rocket-powered aircraft accelerated the trend toward faster planes. Was there a limit to how fast an aircraft could fly? In the 1940s NACA researchers conducted dive-flight research, dropped airplane models from airplanes, fired small solid-propellant rockets, and experimented with rocket-propelled aircraft. The research plane became the research tool of choice for studying supersonic flight in the late '40s and early '50s. The military services sponsored the development of the research planes, contractors built the planes, and the NACA served as research coordinator. NACA's duties included data collection and analysis and therefore the instrumentation of the research planes and the monitoring of flights. These parties developed and tested specialized aerodynamic research airplanes, the first of which was the Bell X-1. Air Force Captain Chuck Yeager flew the X-1 faster than the speed of sound on 14 October 1947. Fast flight was safe! The initial phase of supersonic research using research planes continued through the 1950s. by this time NACA had developed, constructed and placed into operation high-speed wind tunnels and initiated research into supersonic cruise technology, research continued by NACA's successor - NASA.

Derived from text

Supersonic Transports; Research Aircraft; Supersonic Flight; NASA Programs

02 AERODYNAMICS

Includes aerodynamics of flight vehicles, test bodies, airframe components and combinations, wings, and control surfaces. Also includes aerodynamics of rotors, stators, fans and other elements of turbomachinery.

20000105191 Naval Postgraduate School, Monterey, CA USA

An Experimental Investigation of Flapping Wing Propulsion for Micro Air Vehicles

Duggan, Sean J.; Jun. 2000; 70p; In English

Report No.(s): AD-A381120; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Flapping-wing propulsion is studied experimentally through thrust measurements and flow visualization. The objective of the research is to provide further insight into the aerodynamics of flapping-wing micro air vehicles (MAVs). Experimental work is conducted in the NPS 1.5 m x 1.5 m in-draft wind tunnel. A previously constructed model is suspended by thin wires and is used to measure the thrust performance of the flapping-wing MAV. For this experiment, the model is tested in four configurations; three with varying wing mount stiffness and the fourth with an articulated pitch mechanism. Thrust is indirectly determined using a laser range-finder to measure stream-wise displacement of the model. Three methods of flow visualization are attempted to gain further insight into the flow-field around the MAV. First tufts are placed on and around the model to identify the flow-field. Second, a smoke rake placed outside the tunnel is used to route smoke into the test section. Thirdly, a smoke wire system is used to produce smoke in the test section. Experimental results are compared with flow visualization results and previous experimental and numerical work.

DTIC

Flow Visualization; Thrust Measurement; Electric Propulsion; Microelectromechanical Systems; Wind Tunnel Tests; Flapping; Wings; Drone Vehicles

20000105194 Aerospace Corp., Engineering and Technology Group, El Segundo, CA USA

Atmospheric Flight Gust Loads Analysis Final Report

Kim, M. C.; Kabe, A. M.; Lee, S. S.; Jul. 1999; 49p; In English

Contract(s)/Grant(s): F04701-93-C-0094

Report No.(s): AD-A381098; TR-99(1534)-5; SMC-TR-00-24; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A new Monte Carlo atmospheric flight gust loads analysis approach is presented. The procedure uses forcing functions that were derived by extracting the turbulent, short-duration, non-persistent components of measured wind profiles. Over 1000 forcing functions were used in each analysis. The results were analyzed statistically to establish the 99.7 percent enclosure, 90 percent confidence level, load values. Results are presented for a medium lift launch vehicle and a heavy lift launch vehicle. Loads for various altitude bands, time of year, and the Eastern Range and Western Range launch facilities in the United States are compared. Also, the Monte Carlo results are compared to a prevalent synthetic gust analysis approach in use today.

DTIC

Gust Loads; Monte Carlo Method; Launch Vehicles; Atmospheric Circulation

20000108802 Georgia Inst. of Tech., Aerospace Systems Design Lab., Atlanta, GA USA

Technologies for Future Precision Strike Missile Systems: Missile Aeromechanics Technology

Fleeman, Eugene L., Georgia Inst. of Tech., USA; Technologies for Future Precision Strike Missile Systems; September 2000, pp. 2-1 - 2-10; In English; See also 20000108801; Original contains color illustrations; Copyright Waived; Avail: CASI; A02, Hardcopy

This paper provides an assessment of the state-of-the-art of new aeromechanics technologies for future precision strike missile systems. The aeromechanics technologies are grouped into specific discussion areas of aerodynamics, propulsion, and airframe materials technologies. Technologies that are addressed in this paper are: Missile aerodynamics technologies- Assessments include aerodynamic configuration shaping, lattice tail control, split canard control, forward swept surfaces, bank-to-turn maneuvering, and flight trajectory shaping; Missile propulsion technologies- Assessments include supersonic air breathing propulsion, high temperature combustors, low drag ramjet inlets, ramjet inlet/airframe integration, high density fuels, and rocket motor thrust magnitude control; and Missile airframe materials technologies- Assessments include hypersonic structure materials, composite structure materials, hypersonic insulation materials, multi-spectral domes, and reduced parts count structure.

Author

Missile Systems; Aerodynamics; Propulsion; Missile Design; Airframes; Missile Components; Missile Configurations; Missile Control; Radar Homing Missiles

20000108875 NASA Dryden Flight Research Center, Edwards, CA USA

A High Altitude-Low Reynolds Number Aerodynamic Flight Experiment

Greer, Don, NASA Dryden Flight Research Center, USA; Krake, Keith, NASA Dryden Flight Research Center, USA; Hamory, Phil, NASA Dryden Flight Research Center, USA; Drela, Mark, Massachusetts Inst. of Tech., USA; [1999]; 1p; In English; 17th; Applied Aerodynamics, Jun. 28 - 1 Jul. 1999, Norfolk, VA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; No Copyright; Avail: Issuing Activity; Abstract Only

A sailplane is currently being developed at NASA's Dryden Flight Research Center to support a high altitude flight experiment. The purpose of the experiment is to measure the performance characteristics of an airfoil at altitudes between 100,000 and 70,000 feet at Mach numbers between 0.65 and 0.5. The airfoil lift and drag are measured from pitot and static pressures. The location of the separation bubble and vortex shedding are measured from a hot film strip. The details of the flight experiment are presented. A comparison of several estimates of the airfoil performance is also presented. The airfoil, APEX-16, was designed by Drela (MIT) with his MSES code. A two dimensional Navier-Stokes analysis has been performed by Tatineni and Zhong (UCLA) and another at the Dryden Flight Research Center. The role these analysis served to define the experiment is discussed.

Author

High Altitude; Low Reynolds Number; Aerodynamic Drag; Experimentation; Airfoils; Dimensional Analysis; Flight Characteristics

20000109696 Aerospace Corp., Engineering and Technology Group, El Segundo, CA USA

Statistical Analysis of Atmospheric Flight Gust Loads Analysis Data *Final Report*

Clark, J. B.; Kim, M. C.; Kabe, A. M.; Jul. 1999; 28p; In English

Contract(s)/Grant(s): F04701-93-C-0094

Report No.(s): AD-A381315; TR-99(1534)-4; SMC-TR-00-23; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

To establish launch vehicle loads during atmospheric flight, the statistical characteristics of the turbulence/gust-induced loads need to be determined. Recently, a Monte Carlo analysis procedure was developed that uses measured turbulence/gusts to establish launch vehicle loads. This paper presents the procedures developed to characterize the distribution of the data and to calculate tolerance bounds on these Monte Carlo loads.

DTIC

Aerodynamic Loads; Flight Characteristics; Gust Loads; Launch Vehicles; Statistical Analysis

20000109697 Aerospace Corp., Engineering and Technology Group, El Segundo, CA USA

Identifying Slowly-Varying and Turbulent Wind Features for Flight Loads Analyses *Final Report*

Spiekermann, C. E.; Sako, B. H.; Kabe, A. M.; Jul. 1999; 45p; In English

Contract(s)/Grant(s): F04701-93-C-0094

Report No.(s): AD-A381326; TR-99(1534)-2; SMC-TR-00-21; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A methodology developed to determine the spectral boundary between the slowly-varying components and the more rapidly varying, or turbulent components, of measured wind profiles is presented. Pairs of measured wind velocity versus altitude profiles

from the Eastern and Western launch ranges of the United States were used to establish the vertical wavelengths which could no longer be considered slowly varying over discrete time intervals. Analyses were performed for wind pairs that were 30, 60, 90, and 120 minutes apart. The wavelength boundary between slowly-varying and turbulent wind features as a function of time interval is presented. The results of this work make it now possible to identify and extract the slowly-varying and/or turbulent wind features, as needed for a specific day-of-launch flight loads analysis, for these two launch facilities.

DTIC

Wind Velocity; Launch Vehicles; Aerodynamic Loads; Launching

20000109700 Aerospace Corp., El Segundo, CA USA

A Refined and Less Conservative Day-of-Launch Atmospheric Flight Loads Analysis Approach Final Report

Kabe, A. M.; Spiekermann, C. E.; Kim, M. C.; Lee, S. S.; Jul. 1999; 29p; In English

Contract(s)/Grant(s): F04701-93-C-0094

Report No.(s): AD-A381335; TR-99(1534)-1; SMC-TR-00-20; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A day-of-launch atmospheric flight loads analysis approach that reduces conservatism by better defining the components of flight loads that have to be treated statistically and those that can be established with measured wind profiles just prior to launch is described. The approach introduces the concept of removing from measured day-of-launch winds the rapidly varying features, and only using the more slowly changing components in day-of-launch placard calculations. The proposed approach takes advantage of a recently-developed methodology that defines the spectral boundary, as a function of time, between wind components that can be considered slowly varying and those that change rapidly and, hence, have to be addressed statistically.

DTIC

Aerodynamic Loads; Launch Vehicles; Launching

20000109797 Aerospace Corp., Engineering and Technology Group, El Segundo, CA USA

Derivation of Forcing Functions for Monte Carlo Atmospheric Gust Loads Analysis Final Report

Sako, B. H.; Kim, M. C.; Kabe, A. M.; Yeung, W. K.; Jul. 1999; 48p; In English

Contract(s)/Grant(s): F04701-93-C-0094

Report No.(s): AD-A381177; TR-99(1534)-6; SMC-TR-00-25; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A methodology developed to derive forcing functions from the turbulent component of measured wind profiles for a new Monte Carlo gust loads analysis approach is described. Several large sets of forcing functions were developed by extracting the short-duration, random component of measured Jimsphere wind profiles. A database consisting of Jimsphere wind soundings measured over the past three decades at the Eastern and Western Ranges of the USA was used to derive the forcing functions. Validity of these forcing functions for heavy-lift and medium-lift launch vehicles was established by examining the error contributions from various sources within the wind measurement system and the application of a noise-reducing filter. A unique aspect of the method is the extraction of the relatively rapidly changing turbulent component associated with the non-persistent wind features which are expected over a given observation time period.

DTIC

Wind Velocity; Gust Loads; Launch Vehicles; Monte Carlo Method; Wind Measurement; Turbulent Flow; Error Analysis

20000109954 NASA Langley Research Center, Hampton, VA USA

Unsteady Aerodynamic Effects on the Flight Characteristics of an F-16XL Configuration

Wang, Zhongjun, Kansas Univ., USA; Lan, C. Edward, Kansas Univ., USA; Brandon, Jay M., NASA Langley Research Center, USA; [2000]; 15p; In English; Atmospheric Flight Mechanics, 14-17 Aug. 2000, Denver, CO, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Contract(s)/Grant(s): NAG1-1821

Report No.(s): AIAA Paper 2000-3910; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

Unsteady aerodynamic models based on windtunnel forced oscillation test data and analyzed with a fuzzy logic algorithm are incorporated into an F-16XL flight simulation code. The reduced frequency needed in the unsteady models is numerically calculated by using a limited prior time history of state variables in a least-square sense. Numerical examples are presented to show the accuracy of the calculated reduced frequency. Oscillatory control inputs are employed to demonstrate the differences in the flight characteristics based on unsteady and quasi-steady aerodynamic models. Application of the unsteady aerodynamic models is also presented and the results are compared with one set of F16XIL longitudinal maneuver flight data. It is shown that the main differences in dynamic response are in the lateral-directional characteristics, with the quasi-steady model being more stable than the flight vehicle, while the unsteady model being more unstable. Similar conclusions can also be made in a simulated rapid

sideslipping roll. to improve unsteady aerodynamic modeling, it is recommended to acquire test data with coupled motions in pitch, roll and yaw.

Author

Aerodynamic Characteristics; Flight Characteristics; Unsteady Aerodynamics; Models; Computerized Simulation

2000010955 NASA Langley Research Center, Hampton, VA USA

Wake Vortex Transport in Proximity to the Ground

Hamilton, David W., NASA Langley Research Center, USA; Proctor, Fred H., NASA Langley Research Center, USA; [2000]; 9p; In English; 19th; Digital Avionics Systems, 7-13 Oct. 2000, Philadelphia, PA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A sensitivity study for aircraft wake vortex transport has been conducted using a validated large eddy simulation (LES) model. The study assumes neutrally stratified and nonturbulent environments and includes the consequences of the ground. The numerical results show that the nondimensional lateral transport is primarily influenced by the magnitude of the ambient crosswind and is insensitive to aircraft type. In most of the simulations, the ground effect extends the lateral position of the downwind vortex about one initial vortex spacing ($b_{sub o}$) in the downstream direction. Further extension by as much as one $b_{sub o}$ occurs when the downwind vortex remains 'in ground effect' (IGE) for relatively long periods of time. Results also show that a layer-averaged ambient wind velocity can be used to bound the time for lateral transport of wake vortices to insure safe operations on a parallel runway.

Author

Aircraft Wakes; Vortex Precession; Aircraft Performance

20000110519 Rochester Inst. of Tech., Dept. of Mechanical Engineering, NY USA

Improved Drag Calculations Using a Wake Survey at the 0.3M TCT

Ghosh, Amitabha, Rochester Inst. of Tech., USA; 1999 NASA - ODU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; August 2000, pp. 57; In English; See also 20000110509; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

The goals of this project were to improve the experimental wake-rake data acquisition and analysis at the 0.3-Meter Transonic Cryogenic Tunnel (TCT). The objective was to develop an automated optimization algorithm that would minimize the number of survey steps required to characterize the wake profile. An improved analysis tool was developed consisting of several FORTRAN programs, which can check the quality of experimental data and significantly reduce acquisition and processing time. With this method and reduced data acquisition, drag coefficients calculated using 25 survey steps are within 0.01% of the original 100-step data set. Thus the wake survey time has been reduced by a factor of 4. to develop the algorithm the test gas was treated as ideal; the Beattie Bridgeman Gas Law will be used in the final version. Unlike the existing drag calculation, the present work computes and displays of results using non-dimensional variables. Thus the displayed data profiles are invariant of change of units and tunnel conditions. The program asks the user to interactively input the test, run and the point numbers to be processed for computing drag. It calculates drag coefficient using all the rake positions, and then the user is given a choice to process a subset of the total number of positions. Once the user inputs the required number of points, the program smoothes the experimental data and re-computes drag after re-distributing the points. The two calculations are compared and resulting plots are stored in TECPLOT format for display. The 0.3-meter Transonic Cryogenic Tunnel is currently inoperative due to the installation of new adaptive walls. Thus existing experimental data were used for testing the programs. However the improved technique can be easily implemented into the TCT's data reduction algorithms. It offers a quick check of data quality by calculating the mean and standard deviations in 6 key physical quantities. A total of 30 different input files were used to validate the results. Results show that significant reduction of data acquisition time can be achieved without sacrificing accuracy. The goal was to obtain an accuracy of 1/4 drag count. However the program achieves much better than that. Finally recommendations are made on screen for the engineer to gather data at reduced number of prescribed rake positions to obtain the same accuracy.

Author

Cryogenics; Data Acquisition; Drag Measurement; Transonic Wind Tunnels; Wakes; Surveys; Data Processing

20000112934 NASA Langley Research Center, Hampton, VA USA

Static Performance of Six Innovative Thrust Reverser Concepts for Subsonic Transport Applications: Summary of the NASA Langley Innovative Thrust Reverser Test Program

Asbury, Scott C., NASA Langley Research Center, USA; Yetter, Jeffrey A., NASA Langley Research Center, USA; July 2000; 370p; In English; The CD-ROM contains full text document in PDF format

Contract(s)/Grant(s): RTOP 522-25-31-01

Report No.(s): NASA/TM-2000-210300; L-17975; NAS 1.15:210300; NONP-NASA-CD-2000157395; No Copyright; Avail:

CASI; A16, Hardcopy; A03, Microfiche; C01, CD-ROM

The NASA Langley Configuration Aerodynamics Branch has conducted an experimental investigation to study the static performance of innovative thrust reverser concepts applicable to high-bypass-ratio turbofan engines. Testing was conducted on a conventional separate-flow exhaust system configuration, a conventional cascade thrust reverser configuration, and six innovative thrust reverser configurations. The innovative thrust reverser configurations consisted of a cascade thrust reverser with porous fan-duct blocker, a blockerless thrust reverser, two core-mounted target thrust reversers, a multi-door crocodile thrust reverser, and a wing-mounted thrust reverser. Each of the innovative thrust reverser concepts offer potential weight savings and/or design simplifications over a conventional cascade thrust reverser design. Testing was conducted in the Jet-Exit Test Facility at NASA Langley Research Center using a 7.9%-scale exhaust system model with a fan-to-core bypass ratio of approximately 9.0. All tests were conducted with no external flow and cold, high-pressure air was used to simulate core and fan exhaust flows. Results show that the innovative thrust reverser concepts achieved thrust reverser performance levels which, when taking into account the potential for system simplification and reduced weight, may make them competitive with, or potentially more cost effective than current state-of-the-art thrust reverser systems.

Author

Subsonic Speed; Thrust Reversal; Turbofans; Aircraft Brakes; Brakes (For Arresting Motion); Aeronautical Engineering; Aircraft Design; Performance Tests

20000112958 NASA Ames Research Center, Moffett Field, CA USA

Cricket Ball Aerodynamics: Myth Versus Science

Mehta, Rabindra D., NASA Ames Research Center, USA; [2000]; 14p; In English; 3rd; The Engineering of Sport, 9-12 Jun. 2000, Sydney, Australia; Sponsored by International Sports Engineering Association; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Aerodynamics plays a prominent role in the flight of a cricket ball released by a bowler. The main interest is in the fact that the ball can follow a curved flight path that is not always under the control of the bowler. The basic aerodynamic principles responsible for the nonlinear flight or "swing" of a cricket ball were identified several years ago and many papers have been published on the subject. In the last 20 years or so, several experimental investigations have been conducted on cricket ball swing, which revealed the amount of attainable swing, and the parameters that affect it. A general overview of these findings is presented with emphasis on the concept of late swing and the effects of meteorological conditions on swing. In addition, the relatively new concept of "reverse" swing, how it can be achieved in practice and the role in it of ball "tampering", are discussed in detail. A discussion of the "white" cricket ball used in last year's World Cup, which supposedly possesses different swing properties compared to a conventional red ball, is also presented.

Author

Balls; Flight Paths

03

AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; aircraft ground operations; flight safety and hazards; and aircraft accidents. Systems and hardware specific to ground operations of aircraft and to airport construction are covered in 09 Research and Support Facilities (Air). Air traffic control is covered in 04 Aircraft Communications and Navigation.

20000105075 Department of the Air Force, Kirtland AFB, NM USA

The Cost/Benefit of Aging on Safety and Mission Completion in Aviation Professions

King, R. E., Department of the Air Force, USA; Operational Issues of Aging Crewmembers; August 2000, pp. 17-1 - 17-6; In English; See also 20000105060; Copyright Waived; Avail: CASI; A02, Hardcopy

The suspected detrimental effects of aging lead to concerns about aging pilots in civilian and, to a lesser extent, military flying. The typically superior cognitive ability of all pilots, and experience of older pilots in particular, however, render them a valuable asset and dictate they be carefully assessed when concerns about their cognitive ability arise.

Author

Cost Effectiveness; Age Factor; Safety

20000105123 Veridian Engineering, Inc., Dayton, OH USA

Biodynamic Modeling and Simulation of the Ejection Seat/Occupant System *Final Report, May 1996 - Apr. 2000*

April 2000; 16p; In English

Contract(s)/Grant(s): F41624-97-D-6004; AF Proj. 7184

Report No.(s): AD-A380710; AFRL-HE-WP-TR-2000-0080; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Ejection seat dynamic characteristics and potential injury to its occupant are essential concerns for evaluating ejection systems. To better assess the interaction between the ejection seat and the occupant, an ejection seat model, EASY5/ACESII, was coupled with an occupant model, ATE. Additionally, the aerodynamics capabilities in both the seat and occupant models were consolidated. The occupant/seat separation algorithms were also designed and implemented. Simulation graphics were reported and various simulation time histories were compared with those from ejection seat sled tests. The integrated model successfully predicts the major features of the ejection seat motion and the crewmember biodynamics responses.

DTIC

Ejection Seats; Aerodynamics; Biodynamics; Mathematical Models; Simulation; Crews

20000105130 Technische Univ., Faculty of Aerospace Engineering, Delft Netherlands

Landing Capacity of a Dual Threshold Runway

Verbeek, R. J. D.; Nov. 1998; 94p; In English

Report No.(s): PB2000-106609; Memorandum-M-857; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The noise boundaries imposed by the Dutch government on Schiphol Amsterdam airport make it necessary to use special noise abatement procedures to accommodate the growing air traffic. These procedures are studied within the Technological Operational Measures Schiphol (TOMS). Unfortunately, a positive effect on noise expected from these measures does not mean a positive effect on the capacity of the airport. It is necessary to analyze this issue also. The purpose of this report is to examine the effect on the landing capacity of a dual threshold runway. This is a procedure where, due to the usage of an elevated final approach path above the primary path, the separations between the aircraft can be reduced. A positive effect on capacity can be obtained in this way. Also a smaller noise footprint is expected, because of the heightened route. To analyze the effect on capacity the dual threshold runway is investigated theoretically. Also it is implemented into the 'airport and airspace simulator' SIMMOD to test some scenarios quantitatively.

NTIS

Runways; Aircraft Landing; Runway Conditions

20000105131 Technische Univ., Faculty of Aerospace Engineering, Delft Netherlands

Planning and Simulation of Taxiing Aircraft Using Linear Programming

Knijnenburg, S. G.; Aug. 1998; 202p; In English

Report No.(s): PB2000-106612; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

Since 1996, the National Aerospace Laboratory (NLR) and the Faculty of Aerospace Engineering of the Delft University (DUT/FAE) have been involved in a joint research project concerning the development and improvement of a so-called Advanced Surface Movement and Guidance/Control System (A-SMGCS). The purpose of A-SMGCS is to enhance airport ground movement efficiency while at least maintaining current levels of safety, in all weather conditions. The DUT/FAE contribution to the research project is focussed on the development of simulation tools for surface traffic movement and taxi-planning support tools for both on-line and off-line applications. With respect to the first topic, a simulator for airport surface traffic, named SIMAST, has already been developed. The objective of the planning support tools is to optimize the sequencing and scheduling of airport surface traffic, such as to minimize delays and to reduce the number of stops during taxiing.

NTIS

Taxiing; Computerized Simulation; Linear Programming; Surface Navigation; Airports; On-Line Systems; Project Management

20000109692 Federal Aviation Administration, Washington, DC USA

Airport Business Practices and Their Impact on Airline Competition

Oct. 1999; 118p; In English; Original contains color illustrations

Report No.(s): PB2000-108301; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Contents include the following: Overview of the Airport System; Airport's legal obligation to provide reasonable air carrier access in support of competition; Airport access and its effects on Airline competition; Using passenger facility charges to enhance competition; Airport management practices and successful airline entry; Appendix A. Gate usage practices at individual Large and Medium Hub Airports, 1992, 1998 and 2004 and Appendix B. Type of financing arrangements and MII status at individual Large and Medium Hub Airports, 1998.

NTIS

Airline Operations; Airports; Commerce; Competition; Air Transportation

20000109817 Naval Postgraduate School, Dept. of Operations Research, Monterey, CA USA
Modeling and Analysis of Human Error in Naval Aviation Maintenance Mishaps
Fry, Ashley D.; Jun. 2000; 99p; In English
Report No.(s): AD-A381266; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

This study investigates human error associated with 599 Naval Aviation maintenance-related mishaps (MRMs) in Fiscal Years 90-99. The Human Factors Analysis and Classification System Maintenance Extension (HFACS-ME) taxonomy was utilized to classify contributory human errors within a robust theoretical framework. Variable Poisson process models are developed to predict MRMs and relationships between the error dimensions are investigated. The results of this study show that the HFACS-ME taxonomy provides an adequate framework for the classification of MRM causal factors; that variable Poisson process models are suitable for predicting future mishaps, and that there are significant relationships between selected causal dimensions; sufficient to warrant further investigation. These results provide information regarding the predicted impact of MRMs on future operational readiness and mission capability. Through being aware of these aspects, decision-makers are armed with the knowledge to make better decisions concerning the preservation and allocation of the resources at their disposal.

DTIC

Aircraft Maintenance; Human Factors Engineering; Accidents; Human Performance; Errors

20000109820 NASA Langley Research Center, Hampton, VA USA
A Study of Airline Passenger Susceptibility to Atmospheric Turbulence Hazard
Stewart, Eric C., NASA Langley Research Center, USA; [2000]; 15p; In English; Atmospheric Flight Mechanics, 14-17 Aug. 2000, Denver, CO, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): AIAA Paper 2000-3978; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

A simple, generic, simulation math model of a commercial airliner has been developed to study the susceptibility of unrestrained passengers to large, discrete gust encounters. The math model simulates the longitudinal motion to vertical gusts and includes (1) motion of an unrestrained passenger in the rear cabin, (2) fuselage flexibility, (3) the lag in the downwash from the wing to the tail, and (4) unsteady lift effects. Airplane and passenger response contours are calculated for a matrix of gust amplitudes and gust lengths of a simulated mountain rotor. A comparison of the model-predicted responses to data from three accidents indicates that the accelerations in actual accidents are sometimes much larger than the simulated gust encounters.

Author

Mathematical Models; Computerized Simulation; Gusts

20000109968 NASA Langley Research Center, Hampton, VA USA
Explosive Fracturing of an F-16 Canopy for Through-Canopy Crew Egress
Bement, Laurence J., NASA Langley Research Center, USA; [2000]; 15p; In English; 38th, 9-11 Oct. 2000, Reno, NV, USA; Sponsored by Space and Flight Equipment Association, USA; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Through-canopy crew egress, such as in the Harrier (AV-8B) aircraft, expands escape envelopes by reducing seat ejection delays in waiting for canopy jettison. Adverse aircraft attitude and reduced forward flight speed can further increase the times for canopy jettison. However, the advent of heavy, high-strength polycarbonate canopies for bird-strike resistance has not only increased jettison times, but has made seat penetration impossible. The goal of the effort described in this paper was to demonstrate a method of explosively fracturing the F-16 polycarbonate canopy to allow through-canopy crew ejection. The objectives of this effort were to: 1. Mount the explosive materials on the exterior of the canopy within the mold line, 2. Minimize visual obstructions, 3. Minimize internal debris on explosive activation, 4. Operate within less than 10 ms, 5. Maintain the shape of the canopy after functioning to prevent major pieces from entering the cockpit, and 6. Minimize the resistance of the canopy to seat penetration. All goals and objectives were met in a full-scale test demonstration. In addition to expanding crew escape envelopes, this canopy fracture approach offers the potential for reducing system complexity, weight and cost, while increasing overall reliability, compared to current canopy jettison approaches. to comply with International Traffic in Arms Regulations (ITAR) and permit public disclosure, this document addresses only the principles of explosive fracturing of the F-16 canopy materials and the end result. ITAR regulations restrict information on improving the performance of weapon systems. Therefore, details on the explosive loads and final assembly of this canopy fracture approach, necessary to assure functional performance, are not included.

Author

Harrier Aircraft; Polycarbonates; Canopies; Weapon Systems; Supports; Reliability; Fracturing

20000110112 Federal Aviation Administration, Aviation Security Research and Development Div., Atlantic City, NJ USA
Operational Test and Evaluation Plan: Bottle Contents Tester Usability Assessment. Test and Evaluation Plan
Klock, B. A.; Siegel, S.; Maguire, W.; Jul. 13, 2000; 34p; In English

Report No.(s): PB2001-100151; DOT/FAA/AR-00/54; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Explosives and flammable materials may be concealed in bottles in carry-on or checked baggage. Given the volume of passenger baggage and the fact that bottles are often elaborately packaged or sealed, manual inspection of a bottle's contents is a difficult challenge. To improve the screening of liquid containers, devices are currently in development to screen bottles. This document describes a plan for collecting critical information about the interface and usability of a bottle contents tester. The assessment will proceed in two stages: a laboratory assessment at the Aviation Security Laboratory at the Atlantic City International Airport in NJ and a field assessment. Usability of a bottle contents tester in the operational environment as well as screener and passenger acceptance of bottle contents screening will be assessed.

NTIS

Bottles; Human Factors Engineering; Airport Security

20000110191 NASA Langley Research Center, Hampton, VA USA

Reducing Aviation Weather-Related Accidents Through High-Fidelity Weather Information Distribution and Presentation

Stough, H. Paul, III, NASA Langley Research Center, USA; Shafer, Daniel B., NASA Langley Research Center, USA; Schaffner, Philip R., NASA Langley Research Center, USA; Martzaklis, Konstantinos S., NASA Glenn Research Center, USA; [2000]; 13p; In English; 22nd; Congress, 27 Aug. - 1 Sep. 2000, Harrogate, UK; Sponsored by International Council of the Aeronautical Sciences; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In February 1997, the US President announced a national goal to reduce the fatal accident rate for aviation by 80% within ten years. The National Aeronautics and Space Administration established the Aviation Safety Program to develop technologies needed to meet this aggressive goal. Because weather has been identified (is a causal factor in approximately 30% of all aviation accidents, a project was established for the development of technologies that will provide accurate, time and intuitive information to pilots, dispatchers, and air traffic controllers to enable the detection and avoidance of atmospheric hazards. This project addresses the weather information needs of general, corporate, regional, and transport aircraft operators. An overview and status of research and development efforts for high-fidelity weather information distribution and presentation is discussed with emphasis on weather information in the cockpit.

Author

Aircraft Accidents; Aircraft Safety; Flight Safety; Hazards

20000110524 Tennessee Technological Univ., Dept. of Electrical and Computer Engineering, Cookeville, TN USA

Development of the AWIN Integration and Technology Laboratory

Haggard, Roger L., Tennessee Technological Univ., USA; 1999 NASA - ODU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; August 2000, pp. 62; In English; See also 20000110509; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

The goal of the national Aviation Safety Program is to reduce the fatal accident rate for aviation by 80% within ten years. One component of this program at NASA, the Aviation Weather Information (AWIN) project, was created to develop and evaluate new technologies for the presentation of weather hazards to aviation personnel, both groundbased and in-flight. The work presented here primarily details the development of a technology demonstration laboratory, wherein current state-of-the-art weather information display systems are integrated and evaluated. These systems will serve as the framework for defining future display systems with regard to desirable types of weather content and display formats, including factors such as color, symbols, display size, and resolution. Three specific areas of investigation are presented in this study: development of the hardware tab, collection and evaluation of weather sources, and data extraction from flight simulators. The first area, development of the hardware lab, includes the installation and debugging of four weather-related display avionics systems (Echo Flight StratoCheetah, J.P. Instruments NAV-2000, Honeywell/Northstar CT1000H, and Data test FlightVue 640). All of these are compact portable PCs with small color LCD screens, suitable for cockpit use. Most of them include a GPS moving map display and some include hardware/software to collect and display weather information via satellite or Internet. Future hardware and software needs for the lab are also examined. Actual weather information is needed to produce canned weather scenarios for use in the evaluation and testing of the weather display equipment. This second area involves research into the types of weather information needed, a search for appropriate sources of this information, and their evaluation. A summary of suggested weather products is derived. Numerous sources of weather data are examined, including Internet and satellite sources, both free and paid, current and archived. The collection of flight and performance data from commercial flight simulators for performing

weather-related human factors evaluations is the third area of investigation. Specifications are established for purchasing the needed software technology from one simulator vendor, and data extraction software is developed inhouse for another simulator.

Author

Avionics; Information Systems; Software Engineering; Weather; Flying Personnel

20000110530 NASA Langley Research Center, Hampton, VA USA

Estimating The Rate of Technology Adoption for Cockpit Weather Information Systems

Kauffmann, Paul, Old Dominion Univ., USA; Stough, H. P., NASA Langley Research Center, USA; 1999 NASA - ODU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; August 2000, pp. 68; In English; See also 20000110509; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

In February 1997, President Clinton announced a national goal to reduce the weather related fatal accident rate for aviation by 80% in ten years. To support that goal, NASA established an Aviation Weather Information Distribution and Presentation Project to develop technologies that will provide timely and intuitive information to pilots, dispatchers, and air traffic controllers. This information should enable the detection and avoidance of atmospheric hazards and support an improvement in the fatal accident rate related to weather. A critical issue in the success of NASA's weather information program is the rate at which the market place will adopt this new weather information technology. This paper examines that question by developing estimated adoption curves for weather information systems in five critical aviation segments: commercial, commuter, business, general aviation, and rotorcraft. The paper begins with development of general product descriptions. Using this data, key adopters are surveyed and estimates of adoption rates are obtained. These estimates are regressed to develop adoption curves and equations for weather related information systems. The paper demonstrates the use of adoption rate curves in product development and research planning to improve managerial decision processes and resource allocation.

Author

Cockpit Weather Information Systems; Technology Utilization; NASA Programs

20000110930 Spirit Airlines (Pty) Ltd., Melbourne, Australia

Determinants of Price Dispersion in US Airline Markets

Cook, Gerald N., Spirit Airlines (Pty) Ltd., Australia; Journal of Air Transportation World Wide; 2000; ISSN 1093-8826; Volume 5, No. 2, pp. 39-54; In English; Copyright; Avail: Issuing Activity

Although a well recognized and unpredicted post deregulation development, the complex airline fare structure has received relatively little research attention. This paper develops a multiple regression model measuring the relationship of several market variables to the degree of ticket price dispersion observed in the 200 largest US airline markets during the third quarter of 1995. A wide range of ticket prices is evident on most routes. The results show that ticket price dispersion on some given route increases with the number of competitors, with service by a combination of non-stop and connecting flights, when a low-cost airline competes with other major carriers, and when the capacity of one of the airports is limited by regulation. The model explains 41 percent of observed ticket price dispersion.

Author

Airline Operations; Market Research; Mathematical Models; Operating Costs; Economic Analysis

20000110931 International Civil Aviation Organization, Montreal, Quebec Canada

Strategic Alliances of Airlines and Their Consequences

Abeyratne, Ruwantissa I. R., International Civil Aviation Organization, Canada; Journal of Air Transportation World Wide; 2000; ISSN 1093-8826; Volume 5, No. 2, pp. 55-71; In English; Copyright; Avail: Issuing Activity

This article will examine the semantics of strategic airline alliances and the manner in which such alliances overcome bureaucratic obstacles to gain access to open competition. The conclusion will address the issue of aviation safety, which has been inextricably linked by some to the proliferation of air transport activity envisioned in the near future.

Author

Air Transportation; Airline Operations; Agreements

20000110932 King Abdulaziz Univ., Industrial Engineering Dept., Jeddah, Saudi Arabia

The Determinants of Domestic Air Travel Demand in the Kingdom of Saudi Arabia

Ba-Fail, Abdullah O., King Abdulaziz Univ., Saudi Arabia; Abed, Seraj Y., King Abdulaziz Univ., Saudi Arabia; Jasimuddin, Sajjad M., King Abdulaziz Univ., Saudi Arabia; Journal of Air Transportation World Wide; 2000; ISSN 1093-8826; Volume 5, No. 2, pp. 72-86; In English; Copyright; Avail: Issuing Activity

For an airline, analyzing and forecasting air travel market is a part of its corporate planning process. This paper addresses the determinants of domestic air travel demand in the Kingdom of Saudi Arabia. Here an attempt is made to develop models for domestic air travel demand in the Kingdom with different combinations of explanatory variables utilizing stepwise regression technique. The model, which has the total expenditures and population size as the explanatory variables, is the most appropriate model to represent the demand for domestic air travel in the Kingdom. The rest of the models discussed suffer from multicollinearity. The model selected may be used to identify and measure the relations between domestic air travel demand and the economic and demographic forces in the Kingdom.

Author

Air Transportation; Airline Operations; Models; Forecasting

20000110933 State Dept., Foreign Service, USA

The Case of Morris Air: A Successful Startup

Schultz, Albert Charles, State Dept., USA; Schultz, Erika Patricia, Ragusin International, USA; Journal of Air Transportation World Wide; 2000; ISSN 1093-8826; Volume 5, No. 2, pp. 87-110; In English; Copyright; Avail: Issuing Activity

Morris Air, which began scheduled operations in 1992, provides an example of a start-up airline that succeeded during the dark days of US commercial aviation in the early 1990s. Morris Air benefited from a favorable regulatory climate for start-ups but owed most of its success to innovations in cutting costs and to its discipline in filling a well-defined market niche. When Morris Air began to hurt the operations of the major airlines, particularly Delta's hub at Salt Lake City, it began to suffer from aggressive responses that could be considered predatory. Morris Air was sold to Southwest Airlines at the end of 1993, resulting in substantial capital gains for its shareholders. There is evidence that Morris Air's founder anticipated a sale to Southwest from the time she incorporated the airline.

Author

Airline Operations; Operating Costs

20000110934 University of Southern Illinois, Dept. of Aviation Management and Flight, Carbondale, IL USA

University Flight Operations Internships with Major Airlines: Airline Perspectives

NewMyer, David A., University of Southern Illinois, USA; Ruiz, Jose R., University of Southern Illinois, USA; Rogers, Ryan E., University of Southern Illinois, USA; Journal of Air Transportation World Wide; 2000; ISSN 1093-8826; Volume 5, No. 2, pp. 111-129; In English; Copyright; Avail: Issuing Activity

This study examines the partnership between US airlines and aviation-oriented universities that facilitates flight-orientated internship programs. Through the use of a literature review and phone survey, the researchers investigate the similarities and differences between the top twelve airlines' internship programs. Additionally, the researchers work to dispel some of the myths surrounding these programs and reveal the tangible and intangible benefits to the participant, the sponsoring airline and the university.

Author

Airline Operations; Education; University Program

2000011092 Cranfield Univ., Air Transport Group, Bedford, UK

Marketing to Female Business Travellers

Alamdari, Fariba, Cranfield Univ., UK; Burrell, Julian, Business Air Centre Ltd., UK; Journal of Air Transportation World Wide; 2000; ISSN 1093-8826; Volume 5, No. 2, pp. 3-18; In English; Copyright; Avail: Issuing Activity

Business passengers are the most profitable segment of the market for airline industry. Airlines have put an enormous amount of effort into improving the quality of service offered to business travellers. However, a fast growing sub-segment of the market, female business passengers, appears not to be receiving any special attention from airline product planners. In the US it was predicted that female travellers will represent 50 percent of the business travel market by the turn of the century. Such growth in this segment of the market raises a few questions. Do airlines view this sub-segment valuable enough to divert special effort to meet the passenger requirement? Do the requirements of female business travellers differ from those of male business travellers? Does the airline industry meet the travel needs of this sub-segment of the market? How can airlines increase their share of such a growing sub-segment of the market? To address these questions surveys of both airlines and female business travellers in Europe and the US were carried out. The findings indicate that the airlines view the growth of this sub-segment as important. However, only a few carriers have devoted resources to address female business travel needs. Although the needs of the female business travellers are in many ways similar to those of the male business traveller, there are differences in certain areas such as concerns

over airport security, advice on safety and better washrooms. Clearly these requirements must be accommodated if airlines wish to increasingly attract this growing sub-segment of the market.

Author

Airline Operations; Females; Marketing; Passengers

20000111093 Catania Univ., Ist. Strade Ferrovie Aeroporti, Italy

A Fuzzy Approach to Overbooking in Air Transportation

Ignaccolo, Matteo, Catania Univ., Italy; Inturri, Giuseppe, Catania Univ., Italy; Journal of Air Transportation World Wide; 2000; ISSN 1093-8826; Volume 5, No. 2, pp. 19-38; In English; Copyright; Avail: Issuing Activity

A high load factor is important for airlines trying to maximise their profits without alienating customers. The loss of revenue caused by empty seats cannot be recaptured. The aim of this paper is to propose a method that minimises the unused seats and the denied boarding at the same time for every single flight. This can be achieved by monitoring the booking process during the days before the departure and by using an Inference Fuzzy System as an easy decision support system to assist the revenue management analysts.

Author

Airline Operations; Revenue; Passengers; Operational Problems; Fuzzy Systems; Models

20000112905 Royal Aeronautical Society, London, UK

Sharing Best Practice: Synergy in Rail and Aviation Safety: Proceedings

2000; 50p; In English; Sharing Best Practice: Synergy in Rail and Aviation Safety, 18 Oct. 2000, London, UK; See also 20000112906 through 20000112909; ISBN 1-85768-107-X; Copyright; Avail: Issuing Activity

This document represents the proceedings of the meeting of the Royal Aeronautical Society. The conference reviewed safety and safety management practices in the rail industry, and aviation.

Author

Conferences; Safety Management; Aircraft Safety; Aircraft Pilots; Aircraft Survivability; Rail Transportation

20000112906 Shadow Strategic Rail Authority, UK

Organisational Safety Culture, 1, Why Bother?

Sharing Best Practice: Synergy in Rail and Aviation Safety: Proceedings; 2000, pp. 1.1 - 1.7; In English; See also 20000112905; Copyright; Avail: Issuing Activity

The simple rules that are expanded in the presentation therefore are: (1) Recruit wisely; (2) Carry out induction training immediately on joining the company; (3) Use training aids to good effect ensures that on certification you are confident that the job will be done correctly; (4) Drill, drill and drill again; (5) Adopt an open and transparent safety reporting culture; (6) Ensure that development and training for development are a regular and important part of the management system. These rules are clearly not exhaustive. There are many other components which go together to make the human factor a controlled factor within safety management. This presentation attempts to give some simple tests that may be applied to anybody's system to establish whether improvements could be made. We must all strive to reduce the numbers of accidents and incidents, which occur within our industry. Good management equals good safety and good safety equals good management. If we are to do this, human factors are extremely important and we must begin or indeed in some cases continue to value the staff who work for us almost as we would do with our own children.

Derived from text

Safety; Safety Management; Accident Prevention; Avoidance; Fail-Safe Systems

20000112907 Texas Univ., Human Factors Research Project, Austin, TX USA

Organisational Safety Culture, 2, Transferring Human Factors Experience from Aviation to Other Domains

Helmreich, Robert L., Texas Univ., USA; Sharing Best Practice: Synergy in Rail and Aviation Safety: Proceedings; 2000, pp. 2.1 - 2.7; In English; See also 20000112905; Sponsored in part by Gustav Daimler und Karl Benz Stiftung; Copyright; Avail: Issuing Activity

The nature of teamwork and error in situations where teams interact with technology is discussed and the determinants of team performance are described, Cultural and system factors related to error are considered. Aviation's approach to dealing with threat and error is explained and a model of threat and error management presented. Risks and barriers involved in transferring the aviation approach to threat and error management are explored. The need to build programmes on data reflecting the culture

and conditions in the relevant domain is emphasized using the transfer of human factors approaches to medicine. A systematic, data driven approach to building a safety culture is presented.

Author

Human Factors Engineering; Human Performance; Safety; Safety Management; Safety Factors

20000112908 Cranfield Univ., Human Factors Technology Group, Cranfield, UK

Passenger Evacuation and Transference

Muir, Helen, Cranfield Univ., UK; Sharing Best Practice: Synergy in Rail and Aviation Safety: Proceedings; 2000, pp. 3.1 - 3.10; In English; See also 20000112905; Copyright; Avail: Issuing Activity

The issue of passenger safety has always been a major priority within the aviation and rail industries. Although the accident rate in both industries has steadily declined, nevertheless it is unfortunately the case that with the current operating systems accidents will continue to occur from time to time. A priority must be to ensure that where possible the numbers of fatalities and injuries are minimized. From an understanding of human behaviour in emergencies, together with the factors contributing to survival in accidents it is possible to determine the steps which could be taken to move towards the goal of 100% passenger survival in all accidents.

Author

Passengers; Aircraft Safety; Airline Operations; Evacuating (Transportation); Rail Transportation

20000112909 Civil Aviation Authority, Safety Regulation Group, UK

CFIT/Altitude Bust, How Do We Change Behaviour?

Griffiths, R. Peter, Civil Aviation Authority, UK; Sharing Best Practice: Synergy in Rail and Aviation Safety: Proceedings; 2000, pp. 8.1 - 8.5; In English; See also 20000112905; Copyright; Avail: Issuing Activity

This paper considers the way in which the CAA has sought to influence the behaviour of flight crews in relation to Controlled Flight into Terrain (CFIT) and altitude busts. Human factors in the form of Crew Resource Management (CRM) are considered as well as some of the technological aspects of such occurrences. Two typical CFIT incidents are examined and the causal factors considered together with the training and technological improvements which may have helped to alleviate the situation. Altitude busts are also looked at in the above manner and a new scheme to improve the standard of CRM training by the accreditation of instructors is proposed and outlined.

Author

Flight Control; Human Factors Engineering; Flight Altitude; Aircraft Accidents; Aircraft Control; Aircraft Safety

20000112926 Naval Postgraduate School, Monterey, CA USA

Ranger Air Load Planner

Moore, Maximo A., III; Jun. 2000; 82p; In English

Report No.(s): AD-A380251; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The USA Army 75th Ranger Regiment conducts combat parachute operations as part of USA Special Operations Command (USSOCOM). The Rangers are the largest deployable asset of USSOCOM, and are required to plan and execute large-scale parachute assaults into hostile theaters with little or no notice. Generally fighting numerically superior enemy, far from the support of the conventional Army, Rangers must arrive capable of self-sustaining combat operations in any operational environment. This thesis provides Ranger air load planners a tool to rapidly plan feasible mission equipment loads. The Ranger Air Load Planner (RAP) is simple to learn and operate, provides load plans selected from, pre-approved, USA Air Force load templates, and supports dynamic decision support with rapid solution response. An optimization model is used in the thesis to objectively assess the quality of RAP load plans. RAP is a working product that can be adapted for use in air load mission planning by all units under USSOCOM.

DTIC

Mission Planning; Aerodynamic Loads; Attacking (Assaulting); Military Operations

20000113128 Federal Aviation Administration, Office of Aviation Policy and Plans, Washington, DC USA

General Aviation and Air Taxi Activity Survey *Annual Report*

Jul. 2000; 132p; In English

Report No.(s): AD-A382669; FAA-APO-110; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

This report presents the results of the annual General Aviation and Air Taxi Activity Survey. The survey is conducted by the FAA to obtain information on the activity of the USA registered general aviation - and air taxi aircraft fleet. The report contains tabulations of active aircraft, annual flight hours, average flight hours, and other statistics by aircraft type, state and region of based

aircraft, and use. Also included are file: consumption, lifetime airframe hours, estimates of the number of landings, and IFR hours flown.

DTIC

General Aviation Aircraft; Civil Aviation; Taxiing; Airfield Surface Movements; Surveys

20000114488 Illinois Univ. at Urbana-Champaign, Dept. of Civil Engineering, Urbana, IL USA

Development and Evaluation of VFR Lighted Flyways in the Chicago Class B Airspace *Final Report, Apr. 1997 - Mar. 1999*

Hongschaovalit, Pongnate; Dempsey, Berry J.; Oct. 1999; 148p; In English

Report No.(s): PB2000-108481; No Copyright; Avail: CASI; A02, Microfiche; A07, Hardcopy

The objective of this study was to develop a prototype to be used as a VFR flyway marker in the Chicago Class B airspace. by using visual markers as a reference, VFR aircraft may be persuaded from transitioning through controlled airspace. More importantly, by scanning outside more than at the onboard instrument, the pilot's probability to detect other aircraft, terrain, or obstructions would increase. In air-to-ground visual searches, size and color are the most important factors during daytime. With a 3-mile spacing, several testing schemes were developed to analyze the effect of size and colors on perceptibility. A commercially available structure manufactured by Sprung Instant Structure was determined to be the most economical. The recommended size is a ten-panel structure of 40-ft in diameter and 18-ft in height. The colors and marking pattern determined to be the most conspicuous and noticeable are the tangerine orange and yellow combination, with alternating solid colored pattern. Based upon laboratory testing, white lighting beacons capable of Morse code 'S' flashes should be used for nighttime. The intensity of the light should be 200,000-, 20,000-, and 8,000- candelas at daytime, dusk, and nighttime, respectively. Following laboratory testing, flight evaluations were conducted at the University of Illinois and Schaumburg airports. The results of this study has indicated that the prototype could be implemented as a VFR flyway marker. Further investigation is necessary, however, to fully understand its capability as well as its impact on aviation around the Chicago area.

NTIS

Visual Flight Rules; Aircraft Lights; Runway Lights; Air Traffic Control; Visual Control

04

AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes all modes of communication with and between aircraft; air navigation systems (satellite and ground based); and air traffic control.

20000105027 Ohio State Univ., Cognitive Systems Engineering Lab., Columbus, OH USA

Alternative Architectures for Distributed Work in the National Airspace System

Smith, Philip J., Ohio State Univ., USA; Billings, Charles E., Ohio State Univ., USA; Chapman, Roger, Ohio State Univ., USA; Obradovich, Heintz, Ohio State Univ., USA; McCoy, C. Elaine, Ohio Univ., USA; Orasanu, Judith, NASA Ames Research Center, USA; [2000]; 13p; In English

Contract(s)/Grant(s): NCC2-1123; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The architecture for the National Airspace System (NAS) in the United States has evolved over time to rely heavily on the distribution of tasks and control authority in order to keep cognitive complexity manageable for any one individual. This paper characterizes a number of different subsystems that have been recently incorporated in the NAS. The goal of this discussion is to begin to identify the critical parameters defining the differences among alternative architectures in terms of the locus of control and in terms of access to relevant data and knowledge. At an abstract level, this analysis can be described as an effort to describe alternative "rules of the game" for the NAS.

Author

National Airspace System; Architecture (Computers); Distributed Processing; Computer Programs; Alternatives

20000105197 Air Force Inst. of Tech., School of Engineering, Wright-Patterson AFB, OH USA

Development of a Real Time Guidance System for a Kinematic Test Vehicle

Cekic, Orhan; Mar. 2000; 97p; In English

Report No.(s): AD-A380980; AFIT/GE/ENG/00M-21; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

Differential carrier phase GPS measurements are capable of giving centimeter-level accuracies. These accuracies have many potential applications for safety and control of various types of vehicles. For this research, a real-time guidance system is developed. The real-time guidance system can be divided into two components: hardware and software. The hardware component consists of two GPS receivers (one base, one mobile), two wireless 115 Kbaud transceivers, and two laptop computers. One

computer is for the reference station and other is for the mobile receiver interface and graphical display. The guided vehicle is a golf car called the Remote Sensing Autonomous Vehicle for EN (RAVEN). The research concentrated on developing real-time data processing algorithms and using these algorithms to show guidance information to the user via a graphical interface. The developed software reads the real-time GPS data using an RS-232 interface and converts it to a usable form for the data processing algorithms. The data processing algorithm compares the real-time data with the desired track and outputs the guidance information to the guidance display. Based on the information from the guidance display, the user is able to drive on the desired track. Four tests were performed to evaluate the guidance system performance and human factors under different circumstances. These tests include update rate tests, a single instrument test, varying parameter tests, and an under hood test. Tests results and user feedback show that the system performs well under most conditions.

DTIC

Global Positioning System; Software Engineering; Real Time Operation; Information Systems; Test Vehicles; Data Processing; Computer Programs; Autonomy; Guidance (Motion); Remote Sensing

20000105398 Aerospace Corp., Lab. Operations, El Segundo, CA USA

Measurements of Acceleration on Delta GEM Boosters and Road Tests of GPS Position Sensing

Animoto, S. T.; Chang, D. J.; Fournier, E. W.; Yohnsee, E. M.; Jul. 25, 2000; 24p; In English

Contract(s)/Grant(s): F04701-93-C-0094

Report No.(s): AD-A381456; TR-2000(1494)-3; SMC-TR-00-27; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The results of an effort to localize the position of impact on a Delta graphite epoxy motor (GEM) case using accelerometers are reported. Acceleration from impacts produced by a hammer on an empty case was easily sensed using 50-g accelerometers. When the motor case is filled with inert propellant, the magnitude of the acceleration is reduced and damped out rapidly, making detection at longer distances over 2 m more difficult unless more sensitive accelerometers are used. A method to localize or triangulate an impact location was developed and tested using acceleration data. It was necessary to filter the data to reduce its bandwidth to reduce dispersion effects that affect the velocities of the disturbances being sensed. The disturbances were shown to originate from structural deformations. Results from road tests to sense the locations of a GEM motor using GPS are reported. The motor was driven over select roads at Edwards AFB. This effort was part of a larger effort to monitor the health of GEM motor cases at Edwards. Further details of tests at Edwards AFB are described in "Health monitoring for Graphite/Epoxy Motor Cases," ed. by R. Welle, Aerospace Technical Report, TR-2000(1222)-1.

DTIC

Accelerometers; Rocket Engine Cases; Global Positioning System; Position Sensing; Graphite-Epoxy Composites

20000108734 Hampton Univ., VA USA

User's Manual for PCSMS (Parallel Complex Sparse Matrix Solver), Version 1.

Reddy, C. J., Hampton Univ., USA; October 2000; 17p; In English

Contract(s)/Grant(s): NCC1-366; RTOP 522-31-21

Report No.(s): NASA/CR-2000-210537; NAS 1.26:210537; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

PCSMS (Parallel Complex Sparse Matrix Solver) is a computer code written to make use of the existing real sparse direct solvers to solve complex, sparse matrix linear equations. PCSMS converts complex matrices into real matrices and use real, sparse direct matrix solvers to factor and solve the real matrices. The solution vector is reconverted to complex numbers. Though, this utility is written for Silicon Graphics (SGI) real sparse matrix solution routines, it is general in nature and can be easily modified to work with any real sparse matrix solver. The User's Manual is written to make the user acquainted with the installation and operation of the code. Driver routines are given to aid the users to integrate PCSMS routines in their own codes.

Derived from text

User Manuals (Computer Programs); Computer Programs

20000108912 Space and Naval Warfare Systems Center, San Diego, CA USA

Comparing Traditional FFT Based Frequency Domain Excision with Poly-Phase Transform Excision

Abusaleem, Hana; Harris, Fred; Jun. 06, 1999; 11p; In English; Published in Proceedings of the Annual ION Conference (55th), Navigational Technology for the 21st Century, p625-634, 30 Jun 1999. Prepared in cooperation with San Diego State Univ., San Diego, CA.

Report No.(s): AD-A381695; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This work is part of an ONR program to imbed DSP in next generation GPS receivers to mitigate GPS vulnerabilities. We address and compare a number of frequency domain methods for suppressing stationary and slowly sweeping narrow-band interference. Frequency-domain interference excision techniques use the FFT to identify and excise undesired spectral

components. The technique is known as hole-punching, a spectral gating operation that sets to zero those spectral components exceeding specified threshold levels.

DTIC

Fast Fourier Transformations; Frequency Domain Analysis; Global Positioning System; Signal Processing; Spread Spectrum Transmission

20000109719 NASA Goddard Space Flight Center, Greenbelt, MD USA

GPS=A Good Candidate for Data Assimilation?

Poli, P., NASA Goddard Space Flight Center, USA; Joiner, J., NASA Goddard Space Flight Center, USA; Kursinski, R., NASA Goddard Space Flight Center, USA; [2000]; 1p; In English, 30 May - 3 Jun. 2000, Washington, DC, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The Global Positioning System (GPS) enables positioning anywhere about our planet. The microwave signals sent by the 24 transmitters are sensitive to the atmosphere. Using the radio occultation technique, it is possible to perform soundings, with a Low Earth Orbiter (700 km) GPS receiver. The insensitiveness to clouds and aerosols, the relatively high vertical resolution (1.5 km), the self-calibration and stability of the GPS make it a priori a potentially good observing system candidate for data assimilation. A low-computing cost simple method to retrieve both temperature and humidity will be presented. Comparisons with radiosonde show the capability of the GPS to resolve the tropopause. Options for using GPS for data assimilation and remaining issues will be discussed.

Author

Global Positioning System; Meteorology; Remote Sensing; Data Acquisition

20000109796 Colorado Univ., Boulder, CO USA

Comprehension of Navigation Directions Annual Report

Schneider, Vivian I., Colorado Univ., USA; Healy, Alice F., Colorado Univ., USA; Sep. 30, 2000; 17p; In English; Sponsored by Psychonomic Society, USA

Contract(s)/Grant(s): NCC2-1112; DASW01-99-K-0002; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In an experiment simulating communication between air traffic controllers and pilots, subjects were given navigation instructions varying in length telling them to move in a space represented by grids on a computer screen. The subjects followed the instructions by clicking on the grids in the locations specified. Half of the subjects read the instructions, and half heard them. Half of the subjects in each modality condition repeated back the instructions before following them, and half did not. Performance was worse for the visual than for the auditory modality on the longer messages. Repetition of the instructions generally depressed performance, especially with the longer messages, which required more output than did the shorter messages, and especially with the visual modality, in which phonological recoding from the visual input to the spoken output was necessary. These results are explained in terms of the degrading effects of output interference on memory for instructions.

Author

Air Traffic Controllers (Personnel); Message Processing; Programmed Instruction; Air Navigation

20000113669 Technion - Israel Inst. of Engineering, Haifa, Israel

Mixed Strategies for the Interception of Blind Highly Maneuvering Targets Annual Report, 1 Sep. 1998-31 Mar. 2000

Shinar, Josef, Technion - Israel Inst. of Engineering, Israel; Shima, Tal, Technion - Israel Inst. of Engineering, Israel; Apr. 28, 2000; 38p; In English

Contract(s)/Grant(s): F61708-97-C-0004

Report No.(s): AD-A381807; EOARD-SPC-97-4071; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This Annual Technical Report, being the final report on a long-term investigation, has two objectives. It describes the technical effort performed in the last year and also summarizes the results of the entire (two and half years) investigation with an outline of the directions for future research. Most missile guidance laws were developed using linearized two-dimensional models assuming constant speed and maneuverability. Simulation results demonstrated that linear guidance theory, based on such a model, couldn't predict the miss distance in an actual real world time-varying missile/target scenario, such as the interception of a reentering Tactical Ballistic Missile. An earlier Interim Report described the first attempt to extend the linear guidance model to include time-varying speed and maneuverability. In this report the generalized time-varying linear pursuit-evasion game model is developed. Based on this model a modified guidance law with improved homing performance is derived. The predictions of the time-varying linear model are validated by simulations of a realistic Ballistic Missile Defense scenario. Summarizing the more than two years investigation, it can be stated that its objective to gain an "understanding how key parameters in the models of the interceptor missile and of the target affect the outcome of an engagement" has been accomplished at least in a deterministic (noise

free) environment. The affects of time-varying parameters and nonlinear kinematics were separately analyzed. Extension of the investigation to an environment corrupted by measurement noise, having been out of the scope of the reported effort from the outset, seems to be the appropriate direction for future research.

DTIC

Ballistic Missiles; Interception; War Games; Homing Devices; Pursuit-Evasion Games; Maneuverability; Missile Control; Missile Defense

20000113829 Georgetown Univ., Washington, DC USA

An Assessment of USA' Policy Concerning GPS in Light of Current and Planned Changes to the GNSS Environment

Peloquin, Perry J., Georgetown Univ., USA; Aug. 08, 2000; 50p; In English

Report No.(s): AD-A381007; LAWJ-406-09; AFIT-FY00-268; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The current USA policy concerning use, implementation, and control of its Global Positioning System (GPS) global navigation satellite system (GNSS) is focused on autonomous control and oversight. The USA has however, for all intents and purposes, guaranteed that it will provide GPS Standard Positioning Service (SPS) navigational data, free of charge, to the entire world for peaceful, civil use. The USA has further enhanced this commitment by its promise to remove the current Selective Availability (SA) controls from GPS thereby providing worldwide access to the more accurate, non-degraded navigational data. In concert with such assurances, the United States has engaged in a campaign to encourage a universal adoption of GPS and GPS navigational data as the sole satellite source of such data for worldwide air traffic control and management and the myriad of other navigation, positioning, and timing applications made possible by GNSS.

DTIC

Global Positioning System; Navigation Satellites; International Relations; Policies; USA; Satellite Observation

05

AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes all stages of design of aircraft and aircraft structures and systems. Also includes aircraft testing, performance, and evaluation, and aircraft and flight simulation technology.

20000105089 Institut de Medicine Aerospatiale Armee, Departement Sciences Cognitives, Bretigny sur Orge, France

Modern Cockpits: How to Stay Competitive Over Time

Roumes, Corinne, Institut de Medicine Aerospatiale Armee, France; Amalberti, Rene, Institut de Medicine Aerospatiale Armee, France; Operational Issues of Aging Crewmembers; August 2000, pp. 35-1-35-5; In French; See also 20000105060; Copyright Waived; Avail: CASI; A02, Hardcopy

Perceptual and cognitive capacities decrease due to aging can affect pilots' efficiency in flight. Pilots' expertise simultaneously improves as training is performed. This expertise tends to counterbalance functional impairments. to further keep aging effects in check, specific training and pilot management on one hand, cockpit design on the other hand must be implemented. At the cockpit display level, an adaptive interface is a relevant suggestion.

Author

Visual Perception; Visual Observation; Cognitive Psychology; Cognition; Age Factor; Aging (Biology); Mental Performance

20000105203 NASA Marshall Space Flight Center, Huntsville, AL USA

Natural Hazards of the Space Environment

Evans, Steven W., NASA Marshall Space Flight Center, USA; [2000]; 4p; In English; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Spacecraft in Low Earth Orbit (LEO) are subject to numerous environmental hazards. Here I'll briefly discuss three environment factors that pose acute threats to the survival of spacecraft systems and crew: atmospheric drag, impacts by meteoroids and orbital debris, and ionizing radiation. Atmospheric drag continuously opposes the orbital motion of a satellite, causing the orbit to decay. This decay will lead to reentry if not countered by reboost maneuvers. Orbital debris is a by-product of man's activities in space, and consists of objects ranging in size from miniscule paint chips to spent rocket stages and dead satellites. Ionizing radiation experienced in LEO has several components: geomagnetically trapped protons and electrons (Van Allen belts); energetic solar particles; galactic cosmic rays; and albedo neutrons. These particles can have several types of prompt harmful effects on equipment and crew, from single-event upsets, latchup, and burnout of electronics, to lethal doses to crew. All three types of prompt threat show some dependence on the solar activity cycle. Atmospheric drag mitigation and large debris

avoidance require propulsive maneuvers. M/OD and ionizing radiation require some form of shielding for crew and sensitive equipment. Limiting exposure time is a mitigation technique for ionizing radiation and meteor streams.

Derived from text

Aerospace Environments; Dosage; Drag; Galactic Cosmic Rays; Ionizing Radiation; Shielding; Space Debris

20000105401 Southwest Research Inst., San Antonio, TX USA

Development of the Electrochemical Fatigue Sensor for Improved Durability Assessment of Military Aircraft - Phase 1 Final Report, 25 Feb. 1997-25 Feb. 1999

Hudak, S. J.; Miller, M. A.; Cragnolino, G. A.; Dunn, D. S.; McKeighan, P. C.; Aug. 1999; 496p; In English

Contract(s)/Grant(s): F41608-96-D-0108; AF Proj. 3153

Report No.(s): AD-A381488; 18-8784-1; AFRL-ML-WP-TR-1999-4179; No Copyright; Avail: CASI; A21, Hardcopy; A04, Microfiche

The Electrochemical Fatigue Sensor (EFS) concept, initially developed by the University of Pennsylvania, has the potential to provide information on the early stages of fatigue damage in structural materials. Consequently, its applicability to inspection of military aircraft is being assessed in a multi-phased program. Phase 1, reported here, - established the feasibility of EFS for aircraft applications. EFS measurements were shown to change systematically as fatigue damage accumulated in aluminum alloy 7075-T73511, 4130 steel, and titanium alloy Ti- 6Al-4V. The EFS electrolyte was demonstrated to be benign to these aircraft alloys. Fatigue microcracks on bare metal specimens were detected as small as 75 micrometers in surface length. EFS measurements were also shown to be feasible on primer-coated aluminum alloys, although with decreased sensitivity compared to uncoated material. Measurements on aluminum alloy with both primer and top-coat were problematic due to the high electrical impedance of these coatings. The feasibility of making EFS measurements: a) with small sensors (5 ml of electrolyte and 1.5 sq cm footprint), and b) within the electromagnetic background noise typical of aircraft hangars was also demonstrated. A companion technology, Electrochemical Impedance Spectroscopy (EIS), was adapted for detection of fatigue damage in aluminum alloy 7075. Unlike EFS, EIS does not require the structure to be loaded since it perturbs the material electrically, instead of mechanically. However, EIS is in other respects less mature than EFS, and its application to steel and titanium-alloys remains problematic.

DTIC

Durability; Fatigue (Materials); Military Aircraft; Electrochemistry

20000106090 Defence Science and Technology Organisation, Information Technology Div., Fishermens Bend, Australia

A Correlation between Flight-determined Lateral Derivatives and Ground-based Data for the Pilatus PC 9/A Training Aircraft in Cruise Configuration

Keating, Hilary A.; vanBronswijk, Nick; Snowden, Andrew D.; Drobik, Jan S.; Jun. 2000; 59p; In English

Report No.(s): AD-A381432; DSTO-TR-0988; DODA-AR-011-475; Copyright; Avail: Defense Technical Information Center (DTIC)

A series of flight tests were conducted on the PC 9/A aircraft, A23-045, at the Royal Australian Air Force's Aircraft Research and Development Unit. System identification techniques were applied to the data obtained from these flight tests to determine the stability and control derivatives of the aircraft. The lateral results for the aircraft in cruise configuration are presented in this report and comparisons are made with empirical and ground based estimates.

DTIC

Flight Tests; Aircraft Control; Flight Control; Aerodynamic Stability; Cruising Flight

20000107106 Air Command and Staff Coll., Maxwell AFB, AL USA

The Integration of Unmanned Aerial Vehicles into the Function of Counterair

Banks, Ronald L.; Apr. 2000; 50p; In English

Report No.(s): AD-A381841; AU/ACSC/021/2000-04; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

With the recent draw down of the US military after the end of the Cold War, the US Department of Defense (DoD) is placing considerable emphasis on employing a lighter, leaner, and more lethal military force to accomplish the strategic objectives mandated by political leadership. As a force enabler for military forces, Unmanned Aerial Vehicles (UAVs) recently demonstrated their potential during NATO military operations in Kosovo. Their activities were limited to merely gathering enemy intelligence. As a result of advancements in UAVs capabilities, UAVs expanded their operations by directly assisting in combat missions. The resulting logical question that evolved out of the Kosovo operations is, can UAVs be more actively integrated into other military functions to enhance mission accomplishment? More specifically, can UAVs be incorporated into the function of gaining and maintaining control of the air for US forces? to completely answer this question, this research paper will first analyze the current background of UAVs as seen in recent military operations. Secondly, the function of counterair will be examined to identify the

deficiencies US forces have in obtaining control of the air. Third, the present and future capabilities that UAVs can bring to the fight will be identified. Fourth, a detailed examination of which UAVs payloads can be incorporated into the function of counterair will be accomplished. Fifth, this paper will show that UAVs can be effectively integrated to enhance US military weapons systems accomplishment of the function of counterair. Finally, this author will briefly discuss one possible plan to integrate UAVs in the function of counterair to overcome the noted deficiencies.

DTIC

Aerial Reconnaissance; Pilotless Aircraft; Weapon Systems; Defense Program; Combat

20000107161 Flight Test Squadron (0040th), Eglin AFB, FL USA

SEEK EAGLE Dynamic Response Flight Testing of the Pylon Integrated Dispenser Station (PIDS/3) on F-16 Aircraft
Final Report, 3 Nov. 1999 - 14 Jan. 2000

Beausoleil, Richard; Jun. 2000; 56p; In English

Report No.(s): AD-A380179; AAC-LR-00-23; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report presents the configuration data and raw test data collected on two loads instrumentation ground tests and two dynamic response flight tests conducted by the 40th Flight Test Squadron. Testing was performed for the Air Force SEEK EAGLE Office to evaluate the structural integrity of the PIDS/3 pylon during MK-84 LDGP bomb releases at elevated load factor. The primary configuration consisted of CATM-120 missiles carried on stations 1 and 9, a PIDS/3 pylon with a MK-84 LDGP on station 3, a 16S1700 pylon with a MK-84 LDGP on station 7, and a centerline 300-gallon fuel tank. Five missions were planned for the program. Some instrumentation anomalies were discovered during the first mission, which included inaccurate readings from the left butt line (BL)167 and BL180 strain gauges; therefore, one additional mission was added to compare the results with a mission that was previously flown at Edwards Air Force Base, California. The BLi 67 and BLi 80 errors reappeared, and an additional ground mission was performed to measure the aircraft loads during the application of known loads. Following this mission, the errors were attributed to inaccurate equations of motion for the gauges. A correction factor within the equation takes into account the position of the leading edge flap when computing the actual strain on the structure. This correction factor was not accurate and will be recalculated on the basis of the results of the ground mission and a new calibration of the instrumentation within F-i6CG 87-0353.

DTIC

External Stores; Dynamic Response; Flight Tests; F-16 Aircraft; Missiles

20000107173 Air Command and Staff Coll., Maxwell AFB, AL USA

An Investigation of the Non-Distributed Flight Reference (NDFR) Ownship Status Symbology

Brewer, Michael T.; Apr. 2000; 70p; In English

Report No.(s): AD-A381862; AU/ACSC/032/2000-04; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Air Force tactical aircraft, such as the F-15, F-16, and future fighter/attack aircraft, will all be equipped with helmet-mounted displays (HMD) to maintain superior air combat capability in future conflicts. HMDs allow the pilot to point weapons and to quickly slew sensors at visual range targets in either an air-to-air or air-to-ground environment. Further improvements include combining HMDs with panoramic Night Vision Goggles to allow pilots to operate HMD displays in environments with increasingly degraded visual conditions (night/weather). Increased use of HMDs does have a downside, however. Because pilots spend more time with their eyes outside the cockpit, the potential for spatial disorientation, a major cause of Class A mishaps, may increase significantly. Research studies have indicated that if flight and weapons parameters commonly displayed on a heads-up display (HUD) can be provided on HMDs, pilots can remain "heads-out" of the cockpit for longer time periods while maintaining better situational awareness. The Air Force Research Laboratory is currently developing a Non-Distributed Flight Reference (NDFR) symbology set to better support HMD operations in this environment by combining information traditionally distributed across the display into one compact display configuration. The purpose of the NDFR is to allow quick crosscheck of basic ownship information (heading, airspeed, altitude and attitude) while simultaneously providing for an uncluttered display, thus freeing up display real-estate for tactical weapons displays. The objectives of this project were to gather data to validate the usability of the NDFR for off-boresight attitude information and collect qualitative data to determine pilots opinions on the new symbology.

DTIC

Helmet Mounted Displays; Attack Aircraft; Night Vision; Head-Up Displays; Flight Instruments

20000108721 Vanderbilt Univ., Nashville, TN USA

Advanced Instrumentation and Measurements for Early Nondestructive Evaluation of Damage and Defects in Aerostructures and Aging Aircraft *Final Report, 1 Apr. 1993-31 Dec. 1998*

Wikswa, John P., Vanderbilt Univ., USA; Aug. 11, 2000; 222p; In English

Contract(s)/Grant(s): F49620-93-1-0268; AF Proj. 2305

Report No.(s): AD-A381761; AFRL-SR-BL-TR-00-0391; No Copyright; Avail: CASI; A03, Microfiche; A10, Hardcopy

The project is divided into eight tasks which range from the development of NDE instrumentation, theoretical measurement models and experimental techniques, to more basic studies of the initiation and development of fatigue cracks and the magnetic measurement of the electrical currents that are generated during corrosion in aluminum structures. Key aspects of this work have already been transitioned to the Air Force, and a regular program of corrosion measurements is ongoing to support maintenance of the KC-135.

DTIC

Nondestructive Tests; Aircraft Maintenance; Magnetometers; Defects; Cracks

20000108804 Raytheon Co., Alpharetta, GA USA

Missile Seekers for Strike Warfare Beyond the Year 2000

Licata, William H., Raytheon Co., USA; Technologies for Future Precision Strike Missile Systems; September 2000, pp. 4-1 - 4-9; In English; See also 20000108801; Copyright Waived; Avail: CASI; A02, Hardcopy

The goal of this paper is to explore emerging post Cold War missile seeker requirements that will lead to new seeker procurements in the year 2000+. These requirements are compared to existing missile seeker products to show where technology deficiencies exist. A projection is made of what seekers will be deployed in the near future to fill important military missile user needs and where technology investments will be made to develop fully capable missile seekers. The orientation of the presentation is on missile seekers as a product and the functionality they provide the military user community. Therefore, the presentation discusses new functionality not included in seekers built in the 1900's because of technology limitations or lack of sufficient user requirements.

Author

Homing Devices; Missile Control; Radar Homing Missiles; Missile Systems; Target Recognition; Missile Signatures; Trajectory Control; Military Technology

20000108805 Georgia Inst. of Tech., Aerospace Systems Design Lab., Atlanta, GA USA

Technologies for Future Precision Strike Missile Systems: Missile Design Technology

Fleeman, Eugene L., Georgia Inst. of Tech., USA; Technologies for Future Precision Strike Missile Systems; September 2000, pp. 5-1 - 5-13; In English; See also 20000108801; Copyright Waived; Avail: CASI; A03, Hardcopy

This paper provides an assessment of the state-of-the-art and design considerations of missile design technology for future precision strike missile systems. Benefits of missile design technology include advanced missile concepts, identification of driving parameters, balanced subsystems, incorporation of new technologies, light weight/low cost missiles, and launch platform compatibility. The paper discusses the missile design process, presents examples of simulation and spreadsheet conceptual design computer programs, provides missile configuration design criteria, and lists references that are applicable to missile design technology.

Author

Missile Design; Missile Systems; Missile Configurations; Design Analysis; Parameter Identification; Systems Engineering; Missile Control; Structural Design

20000108806 Georgia Inst. of Tech., Aerospace Systems Design Lab., Atlanta, GA USA

Technologies for Future Precision Strike Missile Systems: Missile/Aircraft Integration

Fleeman, Eugene L., Georgia Inst. of Tech., USA; Technologies for Future Precision Strike Missile Systems; September 2000, pp. 7-1 - 7-9; In English; See also 20000108801; Copyright Waived; Avail: CASI; A02, Hardcopy

This paper provides an assessment of the state-of-the-art and design considerations of missile/aircraft integration for future precision strike missile systems. Benefits of missile/aircraft integration include compatibility with a broader range of aircraft carriage platforms, unrestricted carriage envelope, safe and accurate store separation, and enhanced survivability for the aircraft platform. Technologies and design considerations are grouped into the following discussion areas: Missile factor of safety compatibility- Assessments in this area include structural design factor of safety, carriage flight loads, and design specification of the carriage flight environment; Missile carriage and launch compatibility- Assessments in this area include launch platform compatibility constraints, firepower, launcher alternatives, compressed carriage, and standard suspension requirements; and Survivability (missile observables/insensitive munitions) compatibility- Assessments in this area include internal carriage, reduced observable plumes, and insensitive munitions.

Author

Missile Systems; Aircraft Design; Systems Integration; Systems Compatibility; Systems Engineering; Structural Design; Flight Control

20000108807 Swedish Defence Research Establishment, Stockholm, Sweden

Simulation/Design Validation Technology

Berglund, Erik, Swedish Defence Research Establishment, Sweden; Technologies for Future Precision Strike Missile Systems; September 2000, pp. 8-1 - 8-6; In English; See also 20000108801; Copyright Waived; Avail: CASI; A02, Hardcopy

Simulation plays an increasingly important role in the development of new missile systems. This paper contains a brief overview of the various types of simulation models used in different phases of design and evaluation. The main emphasis is placed on trajectory simulation models. The usefulness of different trajectory models for different purposes is treated. A recommendation is to avoid using more complicated models than are required to address the problem of interest. The problem of using a very limited number of test firings to validate a highly complex model is mentioned.

Author

Missile Systems; Systems Simulation; Aerodynamics; Systems Engineering; Two Dimensional Models; Systems Analysis

20000108915 Naval War Coll., Joint Military Operations Dept., Newport, RI USA

Unmanned Aerial Vehicle: A Tool for the Operational Commander *Final Report*

Perry, Chatry D.; May 16, 2000; 21p; In English

Report No.(s): AD-A381737; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The USA has become more dependent upon technology to maintain its warfighting edge in an era of reduced manpower and increasing weapon lethality. This paper addresses the employment of the unmanned aerial vehicle (UAV) to achieve a force multiplier effect for the operational commander. The UAV is able to counter the imbalance of the high risk-to-benefit ratio by substituting programmable; non- lethal aerial vehicles for costly-to-replace manned aircrews and aircraft. This paper presents a historical overview of the evolving military application of the UAV, and a summary of the equipment and characteristics resident in current UAV programs. Additionally, the author provides a correlation of the UAV's functions with certain aspects of Operational Art, and an assessment of the employment of the UAV's capabilities to support current military missions. The UAV is a cost-effective technology that can reduce the operational commander's reliance upon strategic information services, and reduce the risk and political sensitivities associated with the loss or capture of service members.

DTIC

Pilotless Aircraft; Military Operations; Military Technology; Lethality

20000109892 Tokyo Denki Univ., Faculty of Engineering, Japan

Basic Research on Small Rotors for the Use of Hovering in Air

Horiyuki, Toshiyuki, Tokyo Denki Univ., Japan; Tsujiyama, Masashi, Tokyo Denki Univ., Japan; Niwa, Kazuhiro, Tokyo Denki Univ., Japan; Sakaki, Toshitaka, Tokyo Denki Univ., Japan; Kichise, Wataru, Tokyo Denki Univ., Japan; Research Reports of The Faculty of Engineering, Tokyo Denki University; Dec. 1999; ISSN 0389-617X, No. 47, pp. 29-37; In Japanese; Copyright; Avail: Issuing Activity

Basic research on hovering robots is performed, and rotor mechanisms are investigated through various experiments. Main purpose for developing a hovering robot is observing the circumstances of narrow and dangerous places where humans cannot enter. Such robots will be very useful especially in emergency. Lift force obtained by a rotor decrease much by minimizing the rotor size, because it is proportional to the third power of the rotor diameter and to the chord length. The lift given by a rotor with a size of 10-15 cm is about several 10s gf. Therefore, the weight of the robot should be suppressed in minimum. In addition, it is important to consider counter torque balance for the rotor moment and bending back of the rotor wings.

Author

Hovering; Lift; Research; Robots; Rotors

20000110024 Defence Science and Technology Organisation, Air Operations Div., Fishermens Bend, Australia

A Correlation Between Flight-Determined Lateral Derivatives and Ground-Based Data for the Pilatus PC 9/A Training Aircraft in Cruise Configuration

Keating, Hilary A., Defence Science and Technology Organisation, Australia; vanBronswijk, Nick, Defence Science and Technology Organisation, Australia; Snowden, Andrew D., Defence Science and Technology Organisation, Australia; Drobik, Jan S., Defence Science and Technology Organisation, Australia; June 2000; 60p; In English; Original Contains color illustrations Report No.(s): DSTO-TR-0988; DODA-AR-011-475; Copyright; Avail: Issuing Activity

A series of flight tests were conducted on the PC 9/A aircraft, A23-045, at the Royal Australian Air Force's Aircraft Research and Development Unit. System identification techniques were applied to the data obtained from these flight tests to determine

the stability and control derivatives of the aircraft. The lateral results for the aircraft in cruise configuration are presented in this report and comparisons are made with empirical and ground based estimates.

Author

Flight Tests; Derivation; Stability; Control Data (Computers); System Identification

20000110075 Air Force Research Lab., Air Vehicles Directorate, Wright-Patterson AFB, OH USA

Stress Intensity Factors and Crack Interaction in Adjacent Holes Final Report, 1 Jun. 1996 - 30 Aug. 1998

Fawaz, S. A.; de Rijck, J. J.; Apr. 2000; 34p; In English; Prepared in collaboration with The Netherlands Institute for Metals Research, Faculty of Aerospace Engineering, Delft University of Technology, The Netherlands.

Contract(s)/Grant(s): Proj-2401

Report No.(s): AD-A380271; AFRL-VA-WP-TR-2000-3014; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In this analytical investigation, stress intensity factors, K, are calculated for oblique part-elliptical through cracks nucleating and growing from an array of collinear holes subjected to remote tension, bending, and pin loading. The finite element method is used with ;model validation through comparisons to known stress concentration factors solutions. The three-dimensional virtual crack closure technique (3D VCCT) is used to calculate the new K solutions. This work was motivated by the need to predict fatigue crack growth in transport aircraft fuselage lap-splice skin joints. Fatigue crack growth of adjacent through cracks with oblique crack fronts can now be predicted using the results of this investigation.

DTIC

Stress Intensity Factors; Crack Propagation; Aircraft Design; Holes (Mechanics); Stress Concentration

20000110511 Old Dominion Univ., Aerospace Engineering Dept., Norfolk, VA USA

Design Optimization Towards Quieter and More Efficient Aircraft

Baysal, Oktay, Old Dominion Univ., USA; 1999 NASA - ODU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; August 2000, pp. 48; In English; See also 20000110509; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

The motivation is to develop automated optimization tools that would ultimately allow one to design quieter and aerodynamically more efficient aircraft. The current design practices, which mostly rely on the "cut-and-try" approaches, are a major contributor to the prolonged design cycles, hence are not desirable to use. The critical building block to this end, when a gradient-based optimization is to be used, are the sensitivities of the equations governing the underlying physics with respect to the design variables. Although much research has recently been published on the efficient analytical sensitivities, practically all of them are limited to the steady-state flowfield equations. However, it is the unsteady flows that are responsible for the dynamic loads on the aircraft and for the generation of the non-propulsive noise, also known as the airframe noise. Further, an aerodynamic shape optimally designed for steady flows, even when multipoint objectives are used, has inferior unsteady aerodynamic characteristics, as compared to one designed for unsteady flows. Therefore, time-dependent sensitivities are necessitated both by the unsteady flowfield around the aircraft and the propagation of the noise. This constitutes the main objective of the present investigation.

Derived from text

Design Analysis; Noise Propagation; Optimization; Aircraft Noise

20000110625 Naval War Coll., Joint Military Operations Dept., Newport, RI USA

UAV Employment in Kosovo: Lessons for the Operational Commander Final Report

Dixon, J. R.; Feb. 08, 2000; 36p; In English

Report No.(s): AD-A378573; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper addresses how the operational commander used Unmanned Aerial Vehicles (UAVs) during Operation Allied Force in Kosovo. The air phase of Operation Allied Force marked the largest employment of UAVs in military history. The writer argues that UAV doctrine and contingency operations must evolve in order for the operational commander to fully integrate UAVs into the joint force, and UAV intelligence and targeting, combined with reduced risk to U.S. pilots, significantly enhance the warfighting capability of the operational commander. This paper will first analyze the history of UAVs, then discuss their types and capabilities. Next, it will examine UAV employment in Kosovo, and analyze their effectiveness using operational factors as a tool. Finally, the paper will examine their losses, discuss potential roles in peace operations, and deduce lessons learned. Future operations will benefit from improved joint force integration and interoperability of UAVs.

DTIC

Pilotless Aircraft; Warfare; Drone Aircraft; Military Operations

20000112939 Army Vehicle Technology Center, Hampton, VA USA

Simulation of Aircraft Landing Gears with a Nonlinear Dynamic Finite Element Code

Lyle, Karen H., Army Vehicle Technology Center, USA; Jackson, Karen E., Army Vehicle Technology Center, USA; Fasanella, Edwin L., Army Vehicle Technology Center, USA; [2000]; 10p; In English; Modeling and Simulation Technologies, 14-17 Aug. 2000, Denver, CO, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Report No.(s): AIAA Paper 2000-4090; Copyright Waived; Avail: CASI; A02, Hardcopy; A01, Microfiche

Recent advances in computational speed have made aircraft and spacecraft crash simulations using an explicit, nonlinear, transient-dynamic, finite element analysis code more feasible. This paper describes the development of a simple landing gear model, which accurately simulates the energy absorbed by the gear without adding substantial complexity to the model. For a crash model, the landing gear response is approximated with a spring where the force applied to the fuselage is computed in a user-written subroutine. Helicopter crash simulations using this approach are compared with previously acquired experimental data from a full-scale crash test of a composite helicopter.

Author

Landing Gear; Finite Element Method; Crash Landing; Landing Simulation; Computerized Simulation

20000113825 Naval Research Lab., Washington, DC USA

DDG-51 FLT-IIA Airwake Study Part 3: Temperature Field Analysis for Baseline and Upgrade Configurations

Landsberg, Alexandria; Sandberg, William C.; Apr. 17, 2000; 31p; In English

Report No.(s): AD-A377019; NRL/MR/6401-00-8432; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The FAST3D flow solver was used to analyze the unsteady temperature field for a baseline configuration and a proposed upgrade configuration for the DDG-51 Flt-IIA destroyer. The upgrade configuration was proposed to reduce IR signature without impacting other systems, particularly sensitive electronic equipment. The goal of this computational study was to analyze the Unsteady temperature field for the proposed upgrade configuration and identify areas of concern. Comparison are made to the current baseline configuration, since neither experimental nor full-scale data are available.

DTIC

Infrared Signatures; Wakes; Computerized Simulation; Computer Programs; Computational Fluid Dynamics; Unsteady Flow; Temperature Distribution

20000113921 Army Command and General Staff Coll., School of Advanced Military Studies, Fort Leavenworth, KS USA

The Physiological Impacts of Global Attack on Aircrew Performance

Christopherson, Patrick W.; Jan. 2000; 59p; In English

Report No.(s): AD-A374695; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The Air Force's ability to execute global attack is critical. The Air Force markets global attack as a key contribution to the nations military effort. The execution of global attack, partly necessary because of the decline of total force structure and worldwide bases, has put substantial stress on the Air Force's airmen. This monograph analyzes the physiological impacts that global attack execution puts on airmen. Beginning with an introduction to the doctrine and history, the monograph explains the evolution of global attack doctrine and the history perspective it evolved from. Having outlined the history and theory, the monograph looks at the most recent and profound example of global attack, Operation Allied Force. The B-2 "Spirit" bomber missions from Missouri to Kosovo and back provide a unique opportunity to analyze the adverse physiological impacts on the airmen. A focus on aircrew performance related to stress, fatigue, sleep deprivation, and adjustments to work-sleep schedules indicate the level of preparation and reveal the challenges they encountered. The ultimate goal is to determine if aircrews are prepared for the physiological affects they encounter during the execution of global attack. Additionally, it provides insight into the ability to counter the adverse affects and makes the lessons exportable to future Air Force missions.

DTIC

Flight Crews; Stress (Physiology); Bomber Aircraft; Physiology; Fatigue (Biology)

20000114822 Association of the USA Army, Inst. of Land Warfare, Arlington, VA USA

Defense Report: RAH-66 Comanche Helicopter: Key to Future Army Warfighting

Apr. 1999; 3p; In English

Report No.(s): AD-A382443; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

DEFENSE REPORT is published by the Association of the USA Army's Institute of Land Warfare (ILW). The series is designed to provide information on topics that will stimulate professional discussion and further public understanding of the Army's role in national defense.

DTIC

Helicopters; Defense Program; Warfare

20000114842 NASA Ames Research Center, Moffett Field, CA USA

Improving Tiltrotor Whirl-Mode Stability with Rotor Design Variations

Acree, C. W., Jr., NASA Ames Research Center, USA; Peyran, R. J., Army Aviation Systems Command, USA; Johnson, Wayne, NASA Ames Research Center, USA; [2000]; 4p; In English; European Rotorcraft, 26-29 Sep. 2000, The Hague, Netherlands; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Further increases in tiltrotor speeds are limited by coupled wing/rotor whirl-mode aeroelastic instability. Increased power, thrust, and rotor efficiency are not enough: the whirl-mode stability boundary must also be improved. With current technology, very stiff, thick wings of limited aspect ratio are essential to meet the stability requirements, which severely limits cruise efficiency and maximum speed. Larger and more efficient tiltrotors will need longer and lighter wings, for which whirl-mode flutter is a serious design issue. Numerous approaches to improving the whirl-mode airspeed boundary have been investigated, including tailored stiffness wings, active stability augmentation, variable geometry rotors, highly swept tips, and at one extreme, folding rotors. The research reported herein began with the much simpler approach of adjusting the chordwise positions of the rotor blade aerodynamic center and center of gravity, effected by offsetting the airfoil quarter chord or structural mass with respect to the elastic axis. The research was recently extended to include variations in blade sweep, control system stiffness, and pitch-flap coupling (δ_3). As an introduction to the subject, and to establish a baseline against which to measure stability improvements, this report will first summarize results. The paper will then discuss more advanced studies of swept blades and control-system modifications.

Author

Boundaries; Rotation; Rotors; Stability; Stability Augmentation; Wings

20000114863 Southwest Research Inst., Dayton, OH USA

C-130 Flight Control Surfaces Depaint Process Optimization *Final Report, 1 Sep. 1997 - 31 Dec. 1999*

Cundiff, Charles H.; Buckingham, Janet; Dec. 1999; 94p; In English

Contract(s)/Grant(s): F046006-95-D-0176

Report No.(s): AD-A382521; SWRI-01-8455-188; AFRL-ML-WP-TR-2000-4120; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Southwest Research Institute, acting on behalf of the Air Force Coating Technology Integration Office (CTIO), has conducted a test program of a plastic media blast (PMB) process proposed by Ogden Air Logistics Center (OO-ALC) for coatings removal on substrates consisting of spot welded, thin alloy materials. Specifically, the substrates under consideration for this assessment are C-130 flight control surfaces, and are fabricated with 0.016 inch, 2024-T3, clad aluminum.

DTIC

Flight Control; C-130 Aircraft; Coating; Control Surfaces; Paint Removal

20000114869 Southwest Research Inst., Dayton, OH USA

Large Aircraft Coatings Flight Testing *Final Report, 1 Mar. 1997 - 29 Feb. 2000*

Wallace, Elah; Feb. 2000; 97p; In English

Contract(s)/Grant(s): F09603-95-D-0176-RZ03

Report No.(s): AD-A382563; SwRI-01-1886-528; AFRL-ML-WP-TR-2000-4118; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

The reason for this project is to field-test systems that "exceed" current Mil-Spec coating systems. All tested coatings comply with the 1998 National Emissions Standard for Hazardous Air Pollutants (NESHAP). This project provided a tool for ALCs to implement the best performing commercial "off the shelf" (COTS) coating system available, utilizing the results of these KC-135 flights tests.

DTIC

Coatings; Flight Tests; C-135 Aircraft; Air Pollution

AVIONICS AND AIRCRAFT INSTRUMENTATION

Includes all stages of design of aircraft and aircraft structures and systems. Also includes aircraft testing, performance, and evaluation, and aircraft and flight simulation technology.

20000109811 Air Force Inst. of Tech., School of Engineering, Wright-Patterson AFB, OH USA

A Comparative Analysis of Cockpit Display Development Tools

Gebhardt, Matthew J.; Mar. 2000; 118p; In English

Report No.(s): AD-A381233; AFIT/GE/ENG/00M-10; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Currently, no standard methodology exists that enables cockpit display engineers to evaluate software tools used in the development of graphical cockpit displays. Furthermore, little research has been accomplished in comparing current software development tools with traditional hand-coded methods. This research effort discusses a framework for analyzing cockpit display software development tools and follows through with a detailed analysis comparing today's hand-coding standard, OpenGL, with two of today's cockpit display software development suites, Virtual Application Prototyping System (VAPS) and Display Editor. The comparison exploits the analysis framework establishing the advantages and disadvantages of the three software development suites. The analysis framework is comprised of several detailed questionnaires that enable the cockpit engineer to quantify important subjective criteria such as learning curve, user interface, readability, portability, extensibility, and maintenance. The questionnaires developed for each subjective criterion contain questions with weighted answers that enable the cockpit engineer to evaluate graphical software development tools. The questions were adapted from multiple sources including personal experience, display experts, pilots, navigators, case tool, and text sources. In addition, the comparative analysis evaluates several objective criteria with respect to development tools and the displays generated with them such as update rate, development time, executable size, and CPU/Memory usage level.

DTIC

Software Development Tools; Cockpits; Display Devices; Graphical User Interface

20000109850 Commerce Dept., Washington, DC USA

Technologic Papers of the Bureau of Standards. Number 237. Aeronautic Instruments

Hunt, Franklin L., Commerce Dept., USA; May 16, 2023; 66p; In English

Report No.(s): AD-A368673; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

The purpose of this paper is to describe briefly the various types of aircraft instruments which have reached a state of development such that they have found extensive use in service. These are grouped in accordance with the outline given immediately below. A general description of representative instruments of the various types is given, which will be useful to a person who wishes to familiarize himself with the different instruments used on aircraft but is not interested in The mechanical details of their construction.

DTIC

Aircraft Instruments; Flight Instruments

20000110533 New Jersey Inst. of Tech., ECE Dept., Newark, NJ USA

On-Line and Off-Line Test of Airborne Digital Systems

Savir, Jacob, New Jersey Inst. of Tech., USA; 1999 NASA - ODU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; August 2000, pp. 73; In English; See also 20000110509; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

This research deals with studying the effects of both on-line and off-line test during flight critical missions where safety is a major issue. The on-line test, in this context, is a test performed on a digital airborne system during some specified windows in time while it is still performing its intended task. An off-line test is a test that is performed on the digital system once it is taken off-line because of a suspected failure. Both the on-line and the off-line tests are performed during flight. The difference between the two is that the off-line test is more effective than an on-line test due to the Longer amount of time available for testing. Moreover, the off-line test may be designed to have diagnosis and repair capability built-in. Upon successful repair, the faulty processor may be reconfigured back into the system. This capability will undoubtedly increase the mission reliability.

Author

Digital Systems; On-Line Systems; Performance Tests; Airborne Equipment

20000110867 Civil Aeromedical Inst., Oklahoma City, OK USA
Impact of Aviation Highway-in-the-Sky Displays on Pilot Situation Awareness
Williams, Kevin W., Civil Aeromedical Inst., USA; October 2000; 20p; In English
Contract(s)/Grant(s): AM-A-00-HRR-519

Report No.(s): DOT/FAA/AM-00/31; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Thirty-six pilots were tested in a flight simulator on their ability to intercept a pathway depicted on a highway-in-the-sky (HITS) display. While intercepting and flying the pathway, pilots were required to watch for traffic outside the cockpit. Additionally, pilots were tested on their awareness of speed, altitude, and heading during the flight. Results indicated strong practice effects for a pilot's ability to intercept the pathway and that the presence of a flight guidance cue significantly improved performance. The ability to spot traffic was more affected by task difficulty than by display appeal. New display concepts are needed for supporting secondary flight information present on the HITS display. Recommendations for training and use of HITS displays are given, along with recommendations for display enhancements to support situation awareness.

Derived from text

Display Devices; Flight Control; Aircraft Instruments; Flight Paths; Pilot Support Systems; Pilot Performance; Sensorimotor Performance; Flight Instruments; Aircraft Pilots

07

AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and onboard auxiliary power plants for aircraft.

20000105409 Naval Postgraduate School, Monterey, CA USA
Implementation of a Two Probe Tip-Timing Technique to Determine Compressor Blade Vibrations
Osburn, Nicholas G.; Jun. 2000; 54p; In English

Report No.(s): AD-A381876; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This study involved the implementation and validation of a blade-tip time of arrival (TOA) measurement technique, and the development of a computer program to analyze TOA data using a recently published approach. The program was used to analyze experimental compressor data taken in-house using two laser light probes, data generated computationally, and data obtained by others in a compressor test. The in-house compressor data was compared successfully to amplitudes obtained by strobed digital photography. A resonance was successfully detected in the supplied compressor data set.

DTIC

Blade Tips; Compressor Blades; Vibration; Laser Beams; Fatigue (Materials)

20000107160 Advanced Fuel Research, Inc., East Hartford, CT USA
The Application of FT-IR Spectroscopy to Turbine Engine Exhaust Measurement
Marran, D.; Kenny, P.; Markham, J.; Jalbert, P.; Moyers, R.; Gardner, D.; Jan. 2000; 12p; In English; Prepared in cooperation with Sverdrup Technology, Inc. Pub. in American Institute of Aeronautics and Astronautics.
Contract(s)/Grant(s): F41624-97-C-0003

Report No.(s): AD-A380177; AFRL-ML-TY-TP-2000-4551; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An advanced multiple gas analyzer based on Fourier transform infrared (FT-IR) spectroscopy has been used to successfully measure the exhaust composition from a gas turbine engine combustors rig at the Arnold Engineering Development Center (AEDC), Arnold Air Force Base (TN). The advanced FT-IR multigas analyzer was able to demonstrate its ability to not only measure the species traditionally measured at the facility (water, CO₂, CO, NO, NO₂, and total hydrocarbons), but also to measure many other species, including sulfur dioxide, formaldehyde, ethylene, propylene, methanol, formic acid, and nitrous acid. A side by side comparison of the single gas analyzers currently employed by AEDC and the FT-IR Multigas analyzer showed good agreement. The capability of a single relatively low-cost, small sized Multigas analyzer to measure most of the important products of combustion makes it an attractive alternative to existing emissions measurement systems. The Multigas analyzer may be used to measure the exhaust gas composition of aircraft engine combustors that are regulated by the FAA as well as stationary source engines that are regulated by the EPA.

DTIC

Aircraft Engines; Gas Analysis; Gas Turbines; Exhaust Gases; Fourier Transformation; Turbine Engines; Product Development; Gas Detectors

20000108718 Virginia Polytechnic Inst. and State Univ., Dept. of Mechanical Engineering, Blacksburg, VA USA
Steady and Unsteady Heat Transfer in a Film-Cooled Transonic Turbine Cascade, 1 Sep. 1996-31 Dec. 1999
Ng, Wing; Diller, Tom; Popp, Oliver; Jul. 2000; 266p; In English

Contract(s)/Grant(s): F49620-96-1-0465

Report No.(s): AD-A381748; VPI-2000-1; AFRL-SR-BL-TR-00-0410; No Copyright; Avail: CASI; A12, Hardcopy; A03, Microfiche

The unsteady interaction of shock waves emerging from the trailing edge of modern turbine nozzle guide vanes and impinging on downstream rotor blades is modeled in a linear cascade. The Reynolds number based on blade chord and exit conditions (5×10^6) and the exit Mach number (1.2) are representative of modern engine operating conditions. The relative motion of shocks and blades is simulated by sending a shock wave along of stationary shock waves. The blade geometry is a generic version of modern high turning rotor blade with transonic exit conditions. The blade is equipped with a showerhead film cooling scheme.

DTIC

Turbulent Heat Transfer; Film Cooling; Transonic Flow; Gas Turbines; Supersonic Turbines; Steady State; Turbine Blades; Unsteady Flow

20000108756 Maryland Univ., Inst. for Systems Research, College Park, MD USA

Active Stall Control Multistage Compression Systems Final Report, 1 Jun. 1996-31 Dec. 1998

Abed, Eyad H., Maryland Univ., USA; Jun. 27, 2000; 15p; In English

Contract(s)/Grant(s): F49620-96-1-0161

Report No.(s): AD-A381735; AFRL-SR-BL-TR-00-0416; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

This is the final report for AFOSR Grant Number F49620-96-1-0161, Active Control of Surge and Stall in Axial Flow Compressors. The research effort under this grant focused on combined monitoring and control of stall phenomena in axial flow compressors. The cognizant AFOSR Program Manager for the grant was Dr. Marc Jacobs, of the Directorate of Mathematical and Information Sciences and Computational Mathematics. The Principal Investigator on the grant was Dr. Eyad Abed, a Professor in the Department of Electrical and Computer Engineering who holds a joint appointment with the Institute for Systems Research. The technical report begins with a summary of the main goals of the project. Next, the main achievements are discussed. The remainder of the technical report gives information including personnel supported under the grant, publications benefiting from the grant, interactions and transitions, and honors and awards received by the co-Pis during the term of the grant.

DTIC

Nonlinear Systems; Systems Analysis; Feedback Control; Active Control; Turbocompressors; Surges

20000110532 Old Dominion Univ., Dept. of Engineering Technology, Norfolk, VA USA

Numerical simulations of Mixing and Combustion in Scramjet Engines

Mohieldin, Taj O., Old Dominion Univ., USA; 1999 NASA - ODU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; August 2000, pp. 70; In English; See also 20000110509; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

The successful development of the supersonic combustion ramjet (scramjet) for use on future hypersonic vehicles is reliant on detailed understanding of the complex flowfields present in different regions of the system over a range of operating conditions. Constraints on system size and weight have led to the need of improving the technology for analyzing and designing such system. Considerable experimental and numerical research in the USA and abroad, have been conducted in the past thirty years to analyze and design various systems of hypersonic vehicles. Because of constraints on system size and weight, a strong motivation exists to improve combustion systems. Significant amount of experimental and numerical research have been developed towards designing lighter weight and shorter supersonic combustors. For the actual scramjet engine, at high fuel equivalence ratios, the combustor may be operating in the dual-mode regime (with mixed subsonic and supersonic flow). In fact all airbreathing scramjet propulsion systems must pass through this mode of transition, whether accelerating to a hypersonic cruise condition or on a trajectory into orbit. In the dual-mode regime, a shock train is located downstream of the fuel injection locations to provide the pressure rise required by the combustion heat release. At lower Mach numbers, or higher fuel equivalence ratios, this shock train moves upstream and interacts with the fuel injectors to alter the rate of fuel/air mixing. Because of the mixed subsonic/supersonic nature of the flow, it is very difficult to predict the mixing and combustion in this regime using Computational Fluid Dynamics (CFD). This is due to the large region of separated flow downstream of the shock train and the unsteadiness associated with the shock train. The objectives of the proposed research are to investigate and accurately model the mixing and combustion/ignition characteristics in supersonic and dual mode combustion flowfields in Scramjet engine.

Derived from text

Supersonic Combustion Ramjet Engines; Computerized Simulation; Air Breathing Engines; Numerical Analysis; Computational Fluid Dynamics; Multiphase Flow

20000110568 New Energy and Industrial Technology Development Organization, Tokyo, Japan

Fiscal 1997 survey report / R and D of important region technology. R and D of technologies giving multi-functional characteristics to C/C composites, 1, control technology of micro structures of ultra- high temperature members Mar. 31, 1998; 316p; In Japanese; In English

Report No.(s): DE99-736798; ETDE/JP-99736798; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

For the purpose of developing members most suitable for aircraft use engines with methane as fuel, the R and D were conducted of technology to reform surfaces and interfaces of materials. In the R and D, the paper took up carbon fiber reinforced carbon composite materials (C/C composites). In the surface control and reformation technology using the ion engineering method, etc., in the sealing processing of C/C composites, tried was the formation of a C/SiC/Si₃N₄ composite layer which was formed by Si₃N₄ much smaller in thermal expansion coefficient than SiC. Further, technologies on ion injection, thin film formation, giving of oxidation resistance/corrosion resistance, improving/giving of thermal shock resistance, etc. In the multi-functional coating formation technology such as high liability and corrosion resistance, the study was carried out of the dense composite functionally-gradient layer as thermal stress relaxation layer and the fiber reinforced layer by carbon fiber using pores. Besides, studies were made of technologies of the micro structure control combination, evaluation of ultra-high temperature resistant environmental characteristics, etc.

NTIS

Carbon-Carbon Composites; Fiber Composites

20000112945 California Univ., Dept. of Engineering, Berkeley, CA USA

Ensemble Diffraction Measurements of Spray Combustion in a Novel Vitiated Coflow Turbulent Jet Flame Burner *Final Report*

Cabra, R., California Univ., USA; Hamano, Y., California Univ., USA; Chen, J. Y., California Univ., USA; Dibble, R. W., California Univ., USA; Acosta, F., Process Metrix, LLC, USA; Holve, D., Process Metrix, LLC, USA; October 2000; 47p; In English, 13-14 Mar. 2000, Golden, CO, USA; Sponsored by Combustion Inst., USA; Original contains color illustrations Contract(s)/Grant(s): NAG3-2103; RTOP 523-90-13

Report No.(s): NASA/CR-2000-210466; E-12462; NAS 1.26:210466; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An experimental investigation is presented of a novel vitiated coflow spray flame burner. The vitiated coflow emulates the recirculation region of most combustors, such as gas turbines or furnaces; additionally, since the vitiated gases are coflowing, the burner allows exploration of the chemistry of recirculation without the corresponding fluid mechanics of recirculation. As such, this burner allows for chemical kinetic model development without obscurations caused by fluid mechanics. The burner consists of a central fuel jet (droplet or gaseous) surrounded by the oxygen rich combustion products of a lean premixed flame that is stabilized on a perforated, brass plate. The design presented allows for the reacting coflow to span a large range of temperatures and oxygen concentrations. Several experiments measuring the relationships between mixture stoichiometry and flame temperature are used to map out the operating ranges of the coflow burner. These include temperatures as low 300 C to stoichiometric and oxygen concentrations from 18 percent to zero. This is achieved by stabilizing hydrogen-air premixed flames on a perforated plate. Furthermore, all of the CO₂ generated is from the jet combustion. Thus, a probe sample of NO(sub X) and CO₂ yields uniquely an emission index, as is commonly done in gas turbine engine exhaust research. The ability to adjust the oxygen content of the coflow allows us to steadily increase the coflow temperature surrounding the jet. At some temperature, the jet ignites far downstream from the injector tube. Further increases in the coflow temperature results in autoignition occurring closer to the nozzle. Examples are given of methane jetting into a coflow that is lean, stoichiometric, and even rich. Furthermore, an air jet with a rich coflow produced a normal looking flame that is actually 'inverted' (air on the inside, surrounded by fuel). In the special case of spray injection, we demonstrate the efficacy of this novel burner with a methanol spray in a vitiated coflow. As a proof of concept, an ensemble light diffraction (ELD) optical instrument was used to conduct preliminary measurements of droplet size distribution and liquid volume fraction.

Author

Burners; Drop Size; Premixed Flames; Flashback; Combustion

20000114817 Cornell Univ., Dept. of Mathematics, Ithaca, NY USA

Computation Tools for Analysis of Reduced-Order Models for Aeroengine Instabilities *Final Report, 1 Mar. 1997 - 30 Nov. 1999*

Guckenheimer, J.; Nov. 30, 1999; 12p; In English

Contract(s)/Grant(s): F49620-97-1-0135

Report No.(s): AD-A382351; AFRL-SR-BL-TR-00-0437; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The objectives of this project were to develop improved algorithms for analyzing the dynamics of nonlinear systems arising in the study of aeroengines. The emphasis was upon algorithms to compute periodic orbits. A close working relationship was established with United Technologies Research Corporation regarding aerodynamic, aeroelastic and thermoacoustic instabilities of engine components.

DTIC

Computational Fluid Dynamics; Finite Difference Theory; Nonlinear Systems; Hydrodynamics

08

AIRCRAFT STABILITY AND CONTROL

Includes flight dynamics, aircraft handling qualities; piloting; flight controls; and autopilots.

20000107167 Utah Univ., Dept. of Electrical Engineering, Salt Lake City, UT USA

Constrained Control Allocation Methods for Reconfigurable Flight Control Laws *Final Report, 1 Jun 1997-31 May 2000*

Bodson, Marc; Jul. 17, 2000; 49p; In English

Contract(s)/Grant(s): F49620-97-1-0405

Report No.(s): AD-A381657; AFRL-SR-BL-TR-00-0418; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The objective of the project was to develop and analyze methods for control in the presence of actuator saturation. Algorithms were investigated for control allocation, that is, for the problem of distributing control requirements among redundant actuators. A new implementation of the direct allocation method of Durham was proposed. The direct allocation method was chosen because it utilized all of the attainable moment set. A special representation of the moment set in spherical coordinates was considered to speed-up the real-time computations and two rapid search methods were developed and successfully implemented. The direct allocation method was also extended to systems that had previously been excluded, namely those for which subsets of three actuator commands produce linearly dependent moments. Testing of the algorithms was performed using simulation models of a military transport aircraft and of a tailless aircraft.

DTIC

Flight Control; Actuators; Algorithms; Dynamical Systems; Multivariable Control

20000108720 Texas Univ. Health Science Center, Houston, TX USA

Toward A Cognitive Theory of Direct Interaction *Final Report, 1 Jan. 1996-31 Dec. 1999*

Zhang, Jiajie, Texas Univ. Health Science Center, USA; Johnson, Todd R., Texas Univ. Health Science Center, USA; Aug. 15, 2000; 5p; In English

Contract(s)/Grant(s): N00014-96-1-0472; N00014-99-1-0255

Report No.(s): AD-A381753; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

This report is a summary of work done on a project to develop a cognitive theory of direct interaction in the context of dynamic decision retargeting tasks in F/A-18 cockpit. At first, a comprehensive representational analysis was carried out for five navigation instruments (VOR, ADF, RMI, 747 and F/A-18) used in aviation. This analysis generated predictions about the degree of directness of interaction for the five sets of instruments for navigational positioning tasks and more complex retargeting tasks. Several series of experiments were designed to test the predictions and provide data for the refinement of the theory and the development of a computational model. The studies over the project period demonstrate that (a) the cognitive theory of direct interaction can systematically generate theoretical predictions that can be tested in experiments; (b) the methodology of representational analysis is a powerful and systematic tool for the analyses of the real-time retargeting tasks; (c) the Act-R based computational model has promising results; and (d) the analyses of the cockpit navigation instruments can be considered as recommendations for the design of future instruments.

DTIC

Decision Making; Human Factors Engineering; Flight Instruments; Real Time Operation

20000108803 Swedish Defence Research Establishment, Stockholm, Sweden

Guidance and Control Technology

Technologies for Future Precision Strike Missile Systems; September 2000, pp. 3-1 - 3-10; In English; See also 20000108801; Copyright Waived; Avail: CASI; A02, Hardcopy

The fundamental ideas and the basic mathematics of the most common missile guidance laws are outlined. Rules of thumb for the required lateral acceleration for the different guidance laws are given. A brief summary of flight mechanics is given. The

pitch axis control is treated and the dynamic properties are identified. Design of the autopilot for the inner loop using modern methods of controller design is briefly outlined.

Author

Missile Control; Radar Homing Missiles; Autonomous Navigation; Automatic Flight Control; Trajectory Optimization; Automatic Pilots; Dynamic Characteristics; Controllers

20000109829 NASA Langley Research Center, Hampton, VA USA

Multidisciplinary Techniques and Novel Aircraft Control Systems

Padula, Sharon L., NASA Langley Research Center, USA; Rogers, James L., NASA Langley Research Center, USA; Raney, David L., NASA Langley Research Center, USA; [2000]; 16p; In English; 8th; Multidisciplinary Analysis and Optimization, 6-8 Sep. 2000, Long Beach, CA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Report No.(s): AIAA Paper 2000-4848; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Aircraft Morphing Program at NASA Langley Research Center explores opportunities to improve airframe designs with smart technologies. Two elements of this basic research program are multidisciplinary design optimization (MDO) and advanced flow control. This paper describes examples where MDO techniques such as sensitivity analysis, automatic differentiation, and genetic algorithms contribute to the design of novel control systems. In the test case, the design and use of distributed shape-change devices to provide low-rate maneuvering capability for a tailless aircraft is considered. The ability of MDO to add value to control system development is illustrated using results from several years of research funded by the Aircraft Morphing Program.

Author

Airframes; Multidisciplinary Design Optimization; Control Systems Design; Aircraft Control

20000109866 California Univ., Dept. of Mechanical and Aeronautical Engineering, Davis, CA USA

Development of a Design Methodology for Reconfigurable Flight Control Systems

Hess, Ronald A., California Univ., USA; McLean, C., California Univ., USA; [2000]; 14p; In English; 38th; Aerospace Sciences, 10-13 Jan. 2000, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Contract(s)/Grant(s): NCC1-345

Report No.(s): AIAA Paper 2000-0890; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

A methodology is presented for the design of flight control systems that exhibit stability and performance-robustness in the presence of actuator failures. The design is based upon two elements. The first element consists of a control law that will ensure at least stability in the presence of a class of actuator failures. This law is created by inner-loop, reduced-order, linear dynamic inversion, and outer-loop compensation based upon Quantitative Feedback Theory. The second element consists of adaptive compensators obtained from simple and approximate time-domain identification of the dynamics of the 'effective vehicle' with failed actuator(s). An example involving the lateral-directional control of a fighter aircraft is employed both to introduce the proposed methodology and to demonstrate its effectiveness and limitations.

Author

Control Systems Design; Flight Control; Actuators; Compensators; Computerized Simulation

20000109867 California Univ., Dept. of Mechanical and Aeronautical Engineering, Davis, CA USA

A Reconfiguration Scheme for Accommodating Actuator Failures in Multi-Input, Multi-Output Flight Control Systems

Siwakosit, W., California Univ., USA; Hess, R. A., California Univ., USA; [2000]; 20p; In English; Guidance, Navigation and Control, 14-17 Aug. 2000, Denver, CO, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Report No.(s): AIAA Paper 2000-3942; A00-37004; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

A multi-input, multi-output reconfigurable flight control system design utilizing a robust controller and an adaptive filter is presented. The robust control design consists of a reduced-order, linear dynamic inversion controller with an outer-loop compensation matrix derived from Quantitative Feedback Theory (QFT). A principle feature of the scheme is placement of the adaptive filter in series with the QFT compensator thus exploiting the inherent robustness of the nominal flight control system in the presence of plant uncertainties. An example of the scheme is presented in a pilot-in-the-loop computer simulation using a simplified model of the lateral-directional dynamics of the NASA F18 High Angle of Attack Research Vehicle (HARV) that included nonlinear anti-wind up logic and actuator limitations. Prediction of handling qualities and pilot-induced oscillation tendencies in the presence of these nonlinearities is included in the example.

Author

Flight Control; Control Systems Design; Computerized Simulation

20000110542 Binghamton Univ., Dept. of Electrical Engineering, Binghamton, NY USA

Utility of SURE and ASSIST in Reconfigurable Flight Control Systems

Wu, N. Eva, Binghamton Univ., USA; 1999 NASA - ODU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; August 2000, pp. 82; In English; See also 20000110509; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

This summarizes the findings of my study this summer on the applicability of software tools SURE (WinSURE) and ASSIST developed here at NASA Langley to the reliability assessment of reconfigurable flight control systems. The full names of SURE and ASSIST are Semi-markov Unreliability Range Evaluator, and Abstract Semi-markov Specification Interface to the Sure Tool. The purpose of the study is to investigate the potential utility of the software tools in the ongoing effort of the aviation safety program, where the class of systems must be extended beyond the originally intended serving class of electronic digital processors. The first phase of the study is focused on the properties of the reliability models peculiar to reconfigurable flight control systems. These include larger building blocks with no spares and no repairs due to weight and cost constraints; present of both hardware and analytic redundancies; control performance dependent failures; high risks in reconfiguration decisions due to multiple sources of uncertainties. As a consequence, coverage of failures through redundancy management is low in comparison with systems consisting of digital processors only. The second phase of the study is focused on obtaining a semi-Markov model of an existing flight control system. An analysis is performed on the model to identify the key limiting factors for achieving a high reliability in the current reconfigurable flight control systems. Model simplifications are pursued along two different avenues to allow possible on-line and more efficient off-line reliability evaluation. Error bounds are provided for these simplifications to better inform the users of the simplified reliability formulae. This study concludes that SURE and ASSIST are efficient and elaborate tools for reliability assessment of reconfigurable flight control systems with high reliability requirements. Currently however, other aspects of development in such systems are more urgently needed before one can effectively take advantage of these valuable tools.

Author

Flight Control; Reliability Analysis; Software Development Tools; Systems Analysis

20000113401 NASA Langley Research Center, Hampton, VA USA

Reconfigurable Flight Control Using Nonlinear Dynamic Inversion with a Special Accelerometer Implementation

Bacon, Barton J., NASA Langley Research Center, USA; Ostroff, Aaron J., NASA Langley Research Center, USA; [2000]; 15p; In English; Guidance, Navigation and Control, 14-17 Aug. 2000, Denver, CO, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Report No.(s): AIAA Paper 2000-4565; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper presents an approach to on-line control design for aircraft that have suffered either actuator failure, missing effector surfaces, surface damage, or any combination. The approach is based on a modified version of nonlinear dynamic inversion. The approach does not require a model of the baseline vehicle (effectors at zero deflection), but does require feedback of accelerations and effector positions. Implementation issues are addressed and the method is demonstrated on an advanced tailless aircraft. An experimental simulation analysis tool is used to directly evaluate the nonlinear system's stability robustness.

Author

Accelerometers; Flight Control; Nonlinear Systems; Control Systems Design; Computerized Simulation; Dynamic Models

09

RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, runways, hangars, and aircraft repair and overhaul facilities; wind tunnels, water tunnels, and shock tubes; flight simulators; and aircraft engine test stands. Also includes airport ground equipment and systems.

20000109901 Kyushu Univ., Faculty of Engineering, Fukuoka, Japan

Performance Study of a Free-Piston Shock Tunnel Driver Section

Mizoguchi, Makoto, Kyushu Univ., Japan; Fukami, Tomoya, Kyushu Univ., Japan; Aso, Shigeru, Kyushu Univ., Japan; Toshimitsu, Kazuhiko, Kyushu Univ., Japan; Technology Reports of Kyushu University; September 2000; ISSN 0023-2718; Volume 73, No. 5, pp. 593-598; In Japanese; Copyright; Avail: Issuing Activity

In the present study performance of driver section of a free-piston shock tunnel is investigated, which is newly installed in our laboratory for high enthalpy flow study. Characteristics of compression tube are calculated under isentropic assumption, The calculated results agree not well with experimental results. So, the effective pressure of high pressure tube is considered to modify the calculated results. The modified results show good agreements with experiments. Furthermore, the measurements of shock

Mach number and stagnation pressure in low pressure tube are conducted. The relationship between shock Mach number and pressure ratio is obtained in the experiments. The results show that experimental Mach number is lower than theory. While, the relationship between stagnation pressure ratio at the low pressure tube end and incident shock Mach number is obtained, The experimental results approximately agree with theoretical results. For the above results, the performance and operating condition of this facility is estimated.

Author

Enthalpy; Shock Waves; Piston Engines; Shock Tunnels

20000110030 Defence Science and Technology Organisation, Air Operations Div., Melbourne, Australia

Stress Analysis of a Tuner for an Electromagnetic Reverberation Chamber

Weeks, Frank, Defence Science and Technology Organisation, Australia; February 2000; 64p; In English

Report No.(s): DSTO-TN-0272; DODA-AR-011-423; Copyright; Avail: Issuing Activity

Structural analyses of a tuner for a large electromagnetic reverberation chamber are presented in this note. The analyses cover drive motor, highly stressed welds of the paddle assembly, torque in drive shafts, and weld fatigue life. The analyses have been conducted for normal operating conditions as well as for a variety of possible overload conditions. Recommendations for minor modifications are made, including the installation of a safety collar.

Author

Stress Analysis; Tuners; Reverberation Chambers; Fatigue Life; Electromagnetism

20000110230 Defence Science and Technology Organisation, Air Operations Div., Melbourne, Australia

A Feasibility Study Into Increasing the Rotational Speed of the Tuner in the DSTO Electromagnetic Reverberation Chamber

Weeks, Frank, Defence Science and Technology Organisation, Australia; Philp, Grant, Defence Science and Technology Organisation, Australia; February 2000; 20p; In English

Report No.(s): DSTO-TN-0273; DODA-AR-011-424; Copyright; Avail: Issuing Activity

This note presents a feasibility study into reducing the test time in the Defense Science and Technology Organization (DSTO) Electromagnetic Reverberation chamber by increasing the rotational speed of the tuner. The analyses cover the tuner's structural integrity, the drive motor capacity, and whether the drive motor software can be modified to accommodate the increased speed.

Author

Research and Development; Testing Time; Tuners; Reverberation Chambers

20000110525 Christopher Newport Univ., Dept. of Physics, Computer Science and Engineering, Newport News, VA USA

Analysis of wind tunnel Temperature Profiles

Hereford, James, Christopher Newport Univ., USA; 1999 NASA - ODU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; August 2000, pp. 63; In English; See also 20000110509; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

The goal of this research was to analyze the temperature profiles on an internal balance during an actual test at the National Transonic Facility (NTF). We have previously looked at several temperature cycles from the Model Prep Area (MPA) as well as temperature cycles from the laboratory. The MPA and lab temperature cycles have the characteristic that there is no aerodynamic load on the balance so any change in output must be due to the thermal profile. However, there has not been a study that investigates whether these temperature cycles approximate the actual temperature conditions in the test area of NTF. This research project examined data from two tests at the NTF. The analysis was both qualitative and quantitative. The qualitative analysis highlighted the followed characteristics about the temperature profiles: (a) there is a rear (warm) to front (cold) gradient on the balance during tunnel tests; (b) there is a bottom-to-top gradient; (c) the sensors tend to get warmer (rather than cooler) during the runs; (d) the nine temperature measurements do not converge to a particular value but instead tend to stay "parallel". The quantitative analysis tried to characterize the impact of the thermal gradients on the overall accuracy of the data. to do that, we had to use data from the MPA (or the lab) since we do not know axial force (AF) output due to thermal gradients for the tunnel data. For the MPA and lab data, we assumed that all variation in AF output is due to temperature. For the quantitative analysis, we defined two gradient vectors: (TF-TR) and (T4+T7-T5T6). (Note: we also considered two gradient vectors that were derived using the KarhunenLoeve transformation but those vectors did not have any physical significance so they were not used to determine accuracy,) From the MPA data, we derived an equation that gives the error in the AF measurement as a function of the two gradient vectors. We then measured the thermal gradients present in the tunnel test section and computed AF error. The result is that the AF error due to uncompensated thermal gradients is not large. For one data set the error is 0.360 lbs (.09% of full scale) and for the other data set it is 0.137 lbs (.034% of full scale). Another aspect of this research is to apply the temperature gradients that occur in the tunnel

on a balance under controlled conditions in the lab. Progress was made this summer on the data acquisition system to measure temperature and strain from a special-purpose research balance.

Author

Temperature Profiles; Wind Tunnel Tests; Transonic Wind Tunnels; Aerodynamic Balance

20000110534 Old Dominion Univ., Dept. of Mechanical Engineering, Norfolk, VA USA

Review of Implementation Plans for NASA LaRC's Wind - Tunnel University

Selby, Gregory V., Old Dominion Univ., USA; 1999 NASA - ODU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; August 2000, pp. 74; In English; See also 20000110509; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

The NASA LaRC Wind-Tunnel University (WTU) initiative has the following objectives, as interpreted by the present author: 1) to serve as a "learning center" for NASA and non-NASA engineering managers, engineers, and technicians to acquire and sustain basic and advanced skills relevant to the management and operation of wind tunnels and design and execution of windtunnel experiments, including acquisition, analysis, and presentation/publication of wind tunnel data; a) to combine education (broad-based) and training (in-depth, narrow-focused) strategies as appropriate to the skills/knowledge being imparted; b) to prepare participants to operate in the wind-tunnel environment expected to exist in the near future; and 2) to serve as a "resource center" for "best practices" in wind-tunnel skills/knowledge with resource persons drawn principally from the NASA LaRC community, but with participation also from the university and industrial communities.

Derived from text

Wind Tunnel Tests; Education

20000114865 Southwest Research Inst., Dayton, OH USA

Automated Surface Processing of Large Aircraft Final Report, 1 Jun. 1999 - 30 Jun. 2000

Rafferty, William J.; Jun. 2000; 78p; In English

Contract(s)/Grant(s): F42620-96-D-0042

Report No.(s): AD-A382538; AFRL-ML-WP-TR-2000-4121; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Southwest Research Institute, acting on behalf of the Air Force Coating Technology Integration Office (CTIO), has conducted a technology review program to identify new systems for the surface processing of large aircraft. The project was to develop a simple, low cost paint stripping system concept to reduce depot flow time, reduce ALC personnel exposure to the extremely hazardous work environment, and reduce man-hours and lost time due to injuries.

DTIC

Aircraft Maintenance; Technology Assessment; Surface Finishing; Coating

10

ASTRONAUTICS (GENERAL)

Includes general research topics related to space flight and manned and unmanned space vehicles, platforms or objects launched into, or assembled in, outer space; and related components and equipment. Also includes manufacturing and maintenance of such vehicles or platforms.

20000106075 Georgia Inst. of Tech., School of Aerospace Engineering, Atlanta, GA USA

A Method for Integrating Aeroheating into Conceptual Reusable Launch Vehicle Design

Cowart, Karl K.; Aug. 22, 2000; 191p; In English

Report No.(s): AD-A381551; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

A method for integrating Aeroheating analysis into conceptual reusable launch vehicle RLV design is presented in this thesis. This process allows for faster turn-around time to converge a RLV design through the advent of designing an optimized thermal protection system (TPS). It consists of the coupling and automation of four computer software packages: MINIVER1, TPSX2, TCAT3 and ADS4. MINIVER is an Aeroheating code that produces centerline radiation equilibrium temperatures, convective heating rates, and heat loads over simplified vehicle geometries. These include flat plates and swept cylinders that model wings and leading edges, respectively. TPSX is a NASA Ames material properties database that is available on the World Wide Web. The newly developed Thermal Calculation Analysis Tool (TCAT) uses finite difference methods to carry out a transient in-depth 1-D conduction analysis over the center mold line of the vehicle. This is used along with the Automated Design Synthesis (ADS) code to correctly size the vehicle's thermal protection system (TPS). The numerical optimizer ADS uses algorithms that solve

constrained and unconstrained design problems. The resulting outputs for this process are TPS material types, unit thicknesses, and acreage percentages.

DTIC

Aerodynamic Heating; Reusable Launch Vehicles; Design Analysis; Thermodynamic Properties

20000110586 NASA Marshall Space Flight Center, Huntsville, AL USA

X-33 Program Status

Dill, Charlie C., NASA Marshall Space Flight Center, USA; [2000]; 1p; In English; Space 2000, 19-21 Sep. 2000, Long Beach, CA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The presentation briefly presents the current status of the program. The program's objectives and near term plans are stated. A brief description of the vehicle configuration, the technologies to be demonstrated and the missions to be flown are presented. Finally, a status of the vehicle assembly, the launch control center development and the significant test programs' accomplishments are presented.

Author

X-33 Reusable Launch Vehicle; Aerodynamic Configurations

11

CHEMISTRY AND MATERIALS (GENERAL)

Includes general research topics related to the composition, properties, structure, and use of chemical compounds and materials as they relate to aircraft, launch vehicles, and spacecraft.

20000114818 Parsons Engineering Science, Inc., Austin, TX USA

Plan A Assessment Report for Jet Fuel Storage Tank Number 20, Randolph AFB, Texas. LPST ID Number: 104626, Facility ID Number: 32523

Mar. 27, 1996; 213p; In English

Contract(s)/Grant(s): F41624-92-D-8036

Report No.(s): AD-A382393; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

This report includes a revised Site Closure Request Form as attachment 20, in accordance with new guidance issued by the TNRCC in December 1996. Our recommendation for this LPST case number is to close the site from any additional action. No post-closure restoration or abandonment actions are proposed because it would jeopardize the integrity of synthetic liner recently installed around the tank berm and dike structure. The monitoring wells will be maintained to provide coverage of the tank #20 portion of the entire IRP site.

DTIC

Fuel Tanks; Jet Engine Fuels; Environment Effects; SOIL Pollution

12

ENGINEERING (GENERAL)

Includes general research topics to engineering and applied physics, and particular areas of vacuum technology, industrial engineering, cryogenics, and fire prevention.

20000107149 Domel, Zelezniki, Slovenia

The Angle and Speed Calculation of The BLDC Motor From Hall Sensor's Signal With a Discrete Filter *Izracun Kota Zasuka in Hitrosti Elektronsko Komutiranega Motorja iz Signala Hallovih Sond s Pomocjo Diskretnega Filtra*

Rihtarsic, Mitja, Domel, Slovenia; Nastran, Janez, Ljubljana Univ., Slovenia; Sabadin, Ivo, Ljubljana Univ., Slovenia; Electrotechnical Review; 2000; ISSN 0013-5852; Volume 67, No. 2, pp. 124-130; In Slovene; Copyright; Avail: Issuing Activity

A common BLDC motor has three Hall sensors to measure the shaft position ρ . When the rotor has two poles, the exact position is known only six times per revolution. If the position is to be measured more precisely an extra sensor (e. g. an encoder) must be provided. In systems with slow time constants, the position can also be calculated. The calculations are shown. However one can use a discrete filter in order to improve the measurement. Three signals from three Hall sensors are fed into DSP calculating a discrete filter in real time. The filter itself has a nature of an I-controller. The filter transfer function is presented. A block diagram of a filter which is actually calculated by DSP and adapted so it only multiplies angle differences is shown.

Responses of the filter to the step function the filter response at the motor start are shown. After the shaft position is acquired one can calculate also the shaft rotating speed. The measured speed is oscillating at lower speeds. In fact this cannot be filtered out, because such a filter would delay information about speed when the motor is accelerating. The main advantage of the filter is its insensibility to disturbances of the Hall sensor signal which are always present. At high rotating speeds even some manufacturing tolerances can be filtered out. On the other hand, the filter is useless at measuring lower rotating speeds. The rotor must also stand at initialization time so the filter could operate properly. The tested filter was calculated by 16-bit Analog Devices DSP ADMC331 in 15 microseconds every 50 microseconds.

Author

Velocity Measurement; Direct Current; Rotors; Electric Filters; Servomotors; Coders

20000107170 Naval Postgraduate School, Monterey, CA USA

Oscillating Flow About Perforated Cylinders

Osgood, David B.; Sep. 2000; 34p; In English

Report No.(s): AD-A381845; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Circular cylinders of various sizes and perforations were subjected to sinusoidally-oscillating flow in a large U-shaped water tunnel. The force-transfer coefficients (drag and inertia) were determined in the range of Keulegan-Carpenter numbers (K) from about 1 to 40. The results have shown that the effect of the perforations is to decrease the inertia coefficient and to increase the drag coefficient. Thus, perforated cylinders are very efficient dampers and may be used into increase or control the damping of cables and large structures in the ocean environment.

DTIC

Oscillating Flow; Water Tunnel Tests; Circular Cylinders; Perforated Shells; Cables; Aerodynamic Coefficients; Underwater Structures

20000108883 NASA Langley Research Center, Hampton, VA USA

Development of a Large Field of View Shadowgraph System for a 16 Ft. Transonic Wind Tunnel

Talley, Michael A., NASA Langley Research Center, USA; Jones, Stephen B., NASA Langley Research Center, USA; Goodman, Wesley L., NASA Langley Research Center, USA; September 2000; 26p; In English

Contract(s)/Grant(s): RTOP 992-20-03-31

Report No.(s): NASA/TM-2000-210311; L-18009; NAS 1.15:210311; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A large field of view shadowgraph flow visualization system for the Langley 16 ft. Transonic Tunnel (16 ft.TT) has been developed to provide fast, low cost, aerodynamic design concept evaluation capability to support the development of the next generation of commercial and military aircraft and space launch vehicles. Key features of the 16 ft. TT shadowgraph system are: (1) high resolution (1280 X 1024) digital snap shots and sequences; (2) video recording of shadowgraph at 30 frames per second; (3) pan, tilt, & zoom to find and observe flow features; (4) one microsecond flash for freeze frame images; (5) large field of view approximately 12 X 6 ft; and (6) a low maintenance, high signal/noise ratio, retro-reflective screen to allow shadowgraph imaging while test section lights are on.

Author

Shadowgraph Photography; Transonic Wind Tunnels; Flow Visualization; Wind Tunnel Apparatus; Digital Cameras; Nonintrusive Measurement; Systems Engineering

20000114821 Wayne State Univ., Office of Research and Sponsored Programs, Detroit, MI USA

High-speed, High-Resolution Focal Plane Array Imaging System *Final Report, 1 Apr. 1999 - 28 Aug. 2000*

Han, Xiaoyan; Thomas, R. L.; Favro, L. D.; Aug. 28, 2000; 26p; In English

Contract(s)/Grant(s): F49620-99-1-0163

Report No.(s): AD-A382437; AFRL-SR-BL-TR-00-0455; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We have developed a high-resolution, high-speed InSb Focal Plane Array Imager which was built and delivered by Indigo Systems, Inc., of Santa Barbara, CA for use in research and development of thermal wave imaging and nondestructive inspection (NDE) aircraft structures. The design team included Indigo Engineers and faculty from Wayne State. The imager was designed with features intended specifically for use in hangar and field conditions. It includes a sunlight readable monitor, and a 50 foot cable for remote operation. Furthermore, facilities are provided at the camera end of the cable for control of the image acquisition of the computer, so that it can be used as a single-operator system. The camera itself has a very fast, large-area focal plane array

(640 x 512 pixels), a 14-bit dynamic range digitizer, and is capable of acquiring image data at a rate of 40 Mpixels/s. The dynamic range can be extended even further by use of a novel switchable array integration time.

DTIC

Focal Plane Devices; Images; Nondestructive Tests; Aircraft Maintenance; Cracks; Aircraft Structures; Imaging Techniques; Inspection

20000105136 NASA Johnson Space Center, Houston, TX USA

CO₂ Compressor Requirements for Integration of Space Station Carbon Dioxide Removal and Carbon Dioxide Reduction Assemblies

Jeng, Frank F., Lockheed Martin Space Operations, USA; Lewis, John F., Lockheed Martin Space Operations, USA; Graf, John, NASA Johnson Space Center, USA; LaFuse, Sharon, NASA Johnson Space Center, USA; [1999]; 1p; In English; 29th; Environmental Systems, 12-15 Jul. 1999, Denver, CO, USA; Sponsored by Society of Automotive Engineers, Inc., USA
Report No.(s): SAE Paper 1999-01-2195; Copyright; Avail: Issuing Activity; Abstract Only

This paper describes the analysis on integration requirements, CO₂ compressor in particular, for integration of Carbon Dioxide Removal Assembly (CDRA) and CO₂ Reduction Assembly (CRA) as a part of the Node 3 project previously conducted at JSC/NASA. A system analysis on the volume and operation pressure range of the CO₂ accumulator was conducted. The hardware and operational configurations of the CO₂ compressor were developed. The performance and interface requirements of the compressor were specified. An existing Four-Bed Molecular Sieve CO₂ removal computer model was modified into a CDRA model and used in analyzing the requirements of the CDRA CO₂ compressor. This CDRA model was also used in analyzing CDRA operation parameters that dictate CO₂ pump sizing. Strategy for the pump activation was also analyzed.

Author

Carbon Dioxide Removal; Computerized Simulation; Air Purification; Decontamination; Compressors

13

GEOSCIENCES (GENERAL)

Includes general research topics related to the Earth sciences, and the specific areas of petrology, mineralogy, and general geology.

20000105121 National Inst. for Occupational Safety and Health, Div. of Surveillance, Hazard Evaluations and Field Studies, Cincinnati, OH USA

NIOSH Health Hazard Evaluation Report: Continental Express Airlines, Newark, New Jersey

Tubbs, R. L.; Nov. 1999; 28p; In English

Report No.(s): PB2000-107831; HETA-99-0060-2766; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Employees at Continental Express Airlines in Newark, New Jersey, submitted a request for a health hazard evaluation (HHE) to the National Institute for Occupational Safety and Health (NIOSH) on December 8, 1998. The request concerned noise exposures for employees who work in the ramp area of the airport, servicing inbound and outbound aircraft. One specific area of interest was the auxiliary power units located on the regional jet aircraft and the noise they produce while the unit is operational.

NTIS

Airports; Commercial Aircraft; Exposure; Hazards; Jet Aircraft Noise; Occupational Diseases

20000106081 Institute for Environmental Safety and Occupational Risk Analysis, Surveillance Directorate, Brooks AFB, TX USA

Remedial Action Workplan, 1964 B-58 Accident Site, Grissom Air Reserve Base, Bunker Hill, Indiana *Final Report*

Rademacher, Steven E.; Aug. 2000; 36p; In English

Report No.(s): AD-A381508; IERA-SD-BR-SR-2000-0011; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

On December 8, 1964, during a routine Operational Readiness Inspection, a B-58 strategic bomber skidded off the runway at Bunker Hill AFB, IN (later named Grissom Air Force Base). The consequence of the accident was a fire and destruction of five nuclear weapons on the aircraft. The high explosives in the weapons did not detonate, but melted and burned, leaving some residual radioactive contamination in soils adjacent to the runway. The contaminated area was excavated and buried along with the aircraft wreckage at a different location on base. In 1999, AFIERA performed a radiological characterization of the site (IERA-SD-BR-TR-2000-0002). The results of the survey confirm that a small area of the site investigated contains depleted uranium contamination. The investigation area was about 8,800 square meters and had an estimated excess surface activity concentration of 1 pCi/g averaged over the entire area. Within this area, the contamination zone is limited to an area of 1000 square meters, with a mean excess uranium activity concentration of 7 pCi/g. This report details a remedial action plan for the site. The

remedial action work plan details tasks to be accomplished by AFIERA and a private contract organization. Included in the plan are details on 1) pre-remediation site survey, 2) soil removal activities, 3) remedial action support surveys 4) final status soil sampling, and 5) soil backfill of the remediation area.

DTIC

Nuclear Weapons; Aircraft Accidents; SOILs; B-58 Aircraft; Radioactive Contaminants; Contamination

20000110544 Tuskegee Inst., AL USA

Modeling Resolved Subgrid Scale Noise in CAA

Zhou, Ye, Tuskegee Inst., USA; 1999 NASA - ODU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; August 2000, pp. 84; In English; See also 20000110509; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

With the rapid increase in air transportation, the federal government and other countries in the world face increased challenges in associated environmental problems. A chief issue one encounter is the increased landing noise particularly annoying to these residents living near the airport. As reviewed by my LaRC associate, Dr. Macaraeg, NASA LaRC has played a key role in the NASA's airframe noise reduction effort. Specifically at the request by industry partners, LaRC focused on determining fundamental noise source mechanisms by relating sound generation mechanisms to fundamental fluid mechanics. This effort is truly significant since past predictions on noise generations are essentially based on empirical data that no longer suits the newer classes of aircraft. It has been known for sometime that the primary sources emanate from the high lift system and undercarriage of subsonic aircraft with the dominant source vacillates between flap, slat, and gear. Recently, it appears that a compromising scheme, combining the method of large-eddy simulations (LES) for the flow field and the Lighthill analogy for sound generation, has been emerged as a promising approach. Since all the energy-containing scales, e.g., the coherent structure, are captured by LES, the location of the peak sound source is computed exactly. As a result, the LES can yield more accurate results than Reynolds Average Navier-Stokes (RANS) calculations. An important issue related to the noise generation, however, is the effect of the small scales on the source term in Lighthill's analogy. In this case, the acoustic calculation will evaluate the noise generated by the resolved scales along. We would anticipate that this would result in the suppression of high frequency noise. A priori studies suggest that this type of numerical sound could be quite significant. This motivates the subject of this proposal.

Derived from text

Aeroacoustics; Mathematical Models; Computational Grids; Air Transportation

20000107135 NASA Marshall Space Flight Center, Huntsville, AL USA

Precipitation Signatures Observed by EDOP, AMPR and MIR During TRMM-LBA

Wang, J. R., NASA Marshall Space Flight Center, USA; Skofronick-Jackson, G. M., NASA Marshall Space Flight Center, USA; Hood, R., NASA Marshall Space Flight Center, USA; Heymsfield, G. M., NASA Marshall Space Flight Center, USA; Manning, W., NASA Marshall Space Flight Center, USA; [2000]; 1p; In English, 15-19 Dec. 2000, San Francisco, CA, USA; Sponsored by American Geophysical Union, USA; No Copyright; Avail: Issuing Activity; Abstract Only

During the TRMM-LBA (Tropical Rainfall Measuring Mission - Large-Scale Biosphere-Atmosphere Experiment in Amazonia) field campaign of January - February 1999, EDOP (ER-2 Doppler Radar), AMPR (Advanced Microwave Precipitation Radiometer), and MIR (Millimeter-wave Imaging Radiometer) on board the NASA ER-2 aircraft made a number of flights over the same Amazon area for studies of precipitation signatures. It is generally perceived that AMPR, with measurements at the frequencies of 10.7, 19.35, 37.0, and 85 GHz, is not sensitive to precipitation over land; a possible exception is detection through electromagnetic wave scattering at 85 GHz by frozen hydrometeors aloft above the freezing level. Analysis of the combined data sets from these instruments shows that, in the Amazon highly forested areas where the surface emissivity is high and uniform, direct detection of rain by a radiometer at frequencies less than or equal to 37 GHz is possible. The detection of rain is reflected by a depression in brightness temperature, which amounts to as much as 20 K at 19.35 GHz. Measurements at higher frequencies by the MIR help delineate the regions of scattering signatures above the freezing level. Implications of the combined wideband measurements from AMPR and MIR will be discussed.

Author

Biosphere; Doppler Radar; Meteorological Radar; Microwave Radiometers; Millimeter Waves; Precipitation (Meteorology); Trmm Satellite; U-2 Aircraft

LIFE SCIENCES (GENERAL)

Includes general research topics related to plant and animal biology (non-human); ecology; microbiology; and also the origin, development, structure, and maintenance, of animals and plants in space and related environmental conditions.

20000105063 Universidad Complutense, School of Medicine, Madrid, Spain

Age Dependent Alterations Induced by Transmeridian Flights in Airline Pilots

Tresguerres, J. A. F., Universidad Complutense, Spain; Ariznavarreta, C., Universidad Complutense, Spain; Granados, B., Universidad Complutense, Spain; Martin, M., Universidad Complutense, Spain; Villanua, M. A., Universidad Complutense, Spain; Chiesa, J. J., Buenos Aires Univ., Argentina; Golombek, D. A., Buenos Aires Univ., Argentina; Cardinali, D. P., Buenos Aires Univ., Argentina; Operational Issues of Aging Crewmembers; August 2000, pp. 4-1 - 4-5; In English; See also 20000105060; Copyright Waived; Avail: CASI; A02, Hardcopy

Desynchronization among body rhythms and with the environment appears to be linked with jet lag, which may depend on many factors, including age, flight direction and number of time-zones crossed. To analyze this chronobiological state, we performed a multivariate analysis of the circadian system of airline pilots younger and older than 50 years, in Madrid-Mexico-Madrid (-7 time zones, n=12) and Madrid-Tokyo-Madrid (+8 time zones, n=21) flights. Telemetrical devices were used to record pilots' locomotor activity, skin temperature and heart rate, during the flights to and from destiny, and one day after returning to Madrid. In addition the excretion of 6 sulphatoxy melatonin and free cortisol was measured in 6 hourly intervals during the whole period. Time series were analyzed by cosinor and the rhythms were compared by ANOVA and Tukey contrasts. Age (under and over 50 years old) and flight direction groups were considered. Different psychometric tests were carried out at different times of the flights in order to know how pilots are affected by transmeridian flights. Subjective time estimation was also recorded, as well as other psychological variables including anxiety, tiredness and performance. Activity / rest and heart rate rhythms are easily adapted to the new time zones whereas temperature rhythms manifest a rigid response after the phase shifts. Subjective time tended to be overestimated without exhibiting a clear circadian component. Psychometric evaluation showed that desynchronization affects all the pilots. Some results show an age-related variability with more marked influence in younger pilots, while no consistent effects of the flight direction were found.

Author

Age Factor; Aging (Biology); Aircraft Pilots; Jet Lag

20000105065 Department of the Air Force, School of Aerospace Medicine, Brooks AFB, TX USA

Spinal Disease in Aviators and Its Relationship to G-Exposure, Age, Aircraft Seating Angle, Exercise and Other Lifestyle Factors

Drew, William Edward Dougherty, Sr., Department of the Air Force, USA; Operational Issues of Aging Crewmembers; August 2000, pp. 6-1 - 6-9; In English; See also 20000105060; Copyright Waived; Avail: CASI; A02, Hardcopy

Repetitive G-exposures during high-performance (HP) flying have a potential to accelerate the progression of degenerative spinal disease in aviators so exposed. Critical in determining the significance of these G-exposures is the selection of a control group as similar as possible in all other respects to the HP aviators studied.

Author

Spine; Diseases; Aircraft Pilots

20000105068 Army Air Corps, Army Aviation, Stockbridge, UK

Territorial Army Aircrew: "The Senior Pilots" are they at Greater Risk?

Braithwaite, Malcolm G., Army Air Corps, UK; Operational Issues of Aging Crewmembers; August 2000, pp. 10-1 - 10-10; In English; See also 20000105060; Copyright Waived; Avail: CASI; A02, Hardcopy

This paper presents evidence of the operational effects of ageing on British Army aircrew in two areas: a restriction on flying (and other military duties) and accidents due to human factors. The data suggest that the age of Army pilots should not be reduced for operational reasons. There is an underlying trend that, given that pilots with serious medical problems will tend to self-select themselves out of the service reasonably early, the more experienced aviator is both safer in flight and a lesser burden to himself, and the medical services.

Author

Aircraft Pilots; Flight Crews; Age Factor

20000105076 Aeronautique Navale, Centre d'Expertise Medicale du Personnel Navigant, Toulon-Naval, France
Pilots Memory and Psychomotor Performance Evaluation in Relation with Age *Evaluation des Performances Psychomotrices et Mnesiques des Pilotes en Fonction de l'Age*

Taillemite, J. P., Aeronautique Navale, France; Desmants, F., Aeronautique Navale, France; Sicard, B., Aeronautique Navale, France; Niggel, R., Aeronautique Navale, France; Deroche, J., Aeronautique Navale, France; Courtiere, A., Aeronautique Navale, France; Menu, J. P., Aeronautique Navale, France; Operational Issues of Aging Crewmembers; August 2000, pp. 18-1 - 18-6; In French; See also 20000105060; Copyright Waived; Avail: CASI; A02, Hardcopy

Pilots Memory and Psychomotor Performance Evaluation in Relation with Age. Previous studies have shown an age related decrement in the performance of pilots tested in a flight simulator under intense attentional requirements. The purpose of this experiment was to evaluate the relationship between age and aviation related tasks on performance. We tested 31 military and 69 commercial pilots (including 34 former military pilots), age range 23 to 59 years, mean age 40 years old, on SEPIA, a motion based psychomotor evaluation device. SEPIA, similar to a flight simulator, is currently used to screen aviator candidates in the French Navy. A significant correlation was observed between age and psychomotor performance and working memory. Younger pilots tended to perform better than older ones. SEPIA scores were also affected by experience, assessed by total flight time and years of flying. When looking at the different age groups, simulator and memory performance decrements were statistically significant at age 41 and beyond: Type of training and experience, either for fighter, maritime patrol or commercial pilots, did not influence performance. Self graded analysis of simulator performance was in agreement with the real score and not age dependent. These tests did not allow us to evaluate flying skill of the participants, but only psychomotor capacity and adaptation to a new aeronautical environment. However, it is quite valid to take into consideration the age of the pilot when he transitions to another aircraft (after a first performance evaluation, naturally taking into account individual differences).

Author

Aircraft Pilots; Memory; Retention (Psychology); Psychomotor Performance; Pilot Performance

20000105082 National Center of Hygiene, Medical Ecology and Nutrition, Sofia, Bulgaria
Age Effect on Autonomic Cardiovascular Control in Pilots

Nikolova, R., National Center of Hygiene, Medical Ecology and Nutrition, Bulgaria; Danev, S., National Center of Hygiene, Medical Ecology and Nutrition, Bulgaria; Nantcheva, R., Military Medical Academy, Bulgaria; Vukov, M., National Center of Health Informatics, Bulgaria; Operational Issues of Aging Crewmembers; August 2000, pp. 25-1 - 25-11; In English; See also 20000105060; Copyright Waived; Avail: CASI; A03, Hardcopy

The autonomic cardiovascular control was determined as a function of age in 66 military pilots and in 39 referents, both groups aged from 20 to 55 yr. It was assessed by time-domain and frequency-domain heart rate variability (HRV) measures and with some HRV derived indices. Most sensitive to aging process from time-domain HRV measures revealed to be short-term variability and time-domain index, and from frequency-domain HRV measures frequency-domain index. The activity of both ANS branches was found to decline with age, but a different extent of decrease of sympathetic as compared to parasympathetic activity was observed: sympathetic activity reflected by the spectral power of the R-R intervals in the temperature mediated spectral frequency band (0.01-0.05 Hz) decline more slowly than parasympathetic activity reflected by respiratory sinus arrhythmia - mediated spectral frequency band (0.15-0.50 Hz). As well as such age-desynchronized autonomic cardiovascular control was found only in military pilots but not in referents it is concluded that the aging process in pilots is accelerated due to repetitive and prolonged exposure to persisting stress, caused by the compulsory underload (substantial reduction of flying tasks and physical exercises coinciding with personal interviews). Although the computed Overall Health Risk values in both groups were not substantially deviated from "normal", those in military pilots was significantly higher.

Author

Age Factor; Autonomic Nervous System; Cardiovascular System; Aircraft Pilots

20000105084 Institute of Aviation Medicine, Dept. of Functional Diagnostics and Clinical Physiology, Prague, Czechoslovakia
Does Aging or Endothelial Dysfunction Pose a Threat to Military Crewmembers?

Rada, M. A., Institute of Aviation Medicine, Czechoslovakia; Operational Issues of Aging Crewmembers; August 2000, pp. 27-1 - 27-11; In English; See also 20000105060; Copyright Waived; Avail: CASI; A03, Hardcopy

Aging is a physiologic process associated with an increase of health conditions limiting somewhat an aviator's performance abilities generally. What is more, vascular aging is closely linked with an increase in cardiovascular morbidity and mortality. This may be related to cellular changes due to an increased oxidative stress or/and to an impaired release of vasoactive mediators by endothelium cells. Endothelium-dependent relaxation decreases with aging. Consequent cardiovascular changes and damages with or without the presence of other risk factors and bad life style habits may speed up that process. This may lead to clinical manifestation of the disease, grounding, treatment and even to a permanent disqualification from flying duty not surprisingly

within the third and fourth decade. Besides aging, which is an independent risk factor per se, there are new scientific discoveries which have refined our understanding of the endothelium dysfunction process complexity. Additionally, it has been proven that some medicaments like HMG-CoA reductase inhibitors, ACE inhibitors and Ca antagonists, particularly those with a long duration of action, improve endothelium function of the coronary circulation in patients with atherosclerosis or hypertension along with an appropriate physical activity, smoking cessation, glucose intake restriction etc. The content of this paper is focused on highlighting new aspects of aging, links between them, mechanisms of action and interaction. The whole process should be seen as a complex of mechanical, humoral, nutritious, metabolic, endocrine and exogenous factors interplay, having a deleterious impact on human health status, crewmembers including. The end-stage occurs more earlier than simply in the course of natural aging process. Better understanding of these facts was contrasted with clinical findings among the group of Czech military aviators primarily treated for hypertension, as well as for hyperlipidemia and hyperuricemia over the past five years. We succeeded in good control of hypertension pharmacologically, but we failed with influencing of other discovered risk factors. No wonder, that prior to ending up this study, three aviators were disqualified for flying duty due to coronary artery disease (CAD) development. Based on comparison of known experimental facts, clinical trial outcomes and our findings, we have tried to formulate possible pathways for changing our minds and defined particular steps in order to reverse the unwanted trends reached so far in the management of cardiovascular diseases. These steps consist of non-pharmacological and pharmacological interventions in crewmembers. The answer to the question at the beginning will be more elucidated and sophisticated steps then formulated at the end of this paper.

Author

Aging (Biology); Cells (Biology); Risk; Armed Forces; Aircraft Pilots; Pilot Performance; Operator Performance

20000105088 Army Aeromedical Research Lab., Fort Rucker, AL USA

Visual Performance on the Small Letter Contrast Test: Effects of Aging, Low Luminance and Refractive Error

vandePol, Corina, Army Aeromedical Research Lab., USA; Rabin, Jeff, Army Aeromedical Research Lab., USA; Operational Issues of Aging Crewmembers; August 2000, pp. 34-1 - 34-5; In English; See also 20000105060; Copyright Waived; Avail: CASI; A02, Hardcopy

In this study the visual performance of aviators and a myopic, non-aviator group were compared to determine the effects of aging, available light and refractive error. The chart used is a novel chart called the Small Letter Contrast Test (SLCT) which measures sensitivity to contrast at the moderate to high end of the spatial frequency range near the visual acuity thresholds of most normal observers. All three variables influence visual performance on the SLCT, age having a greater effect on low luminance performance and refractive error having comparable effects on SLCT performance regardless of luminance level. High contrast visual acuity remains fairly stable and normal over the age range tested; however it decreases with increasing refractive error.

Author

Visual Perception; Visual Observation; Aircraft Pilots

20000108687 Air Force General Hospital, Beijing, China

Characteristics and Effect of Allergic Rhinitis in Aircrew on Flight

Xu, Xian-Rong, Air Force General Hospital, China; Guo, Li-Ying, Air Force General Hospital, China; Liu, Hua-Feng, Air Force General Hospital, China; Gong, Wei-Xi, Air Force General Hospital, China; Zhang, Yang, Air Force General Hospital, China; Ye, Tao, Air Force General Hospital, China; Space Medicine and Medical Engineering; Jun. 2000; ISSN 1002-0837; Volume 13, No. 3, pp. 207-209; In Chinese; Copyright; Avail: Issuing Activity

Objective. to observe the characteristics of allergic rhinitis in aircrew and its effect on flight. Method. Case studies of allergic rhinitis were made in 32 aircrew. Result. There were 20 cases of perennial allergic rhinitis and 12 cases of seasonal allergic rhinitis in 32 aircrew. Twenty-six cases are still in a qualified position to continue their flying job and the other six cases were permanently grounded. Conclusion. Allergic rhinitis in aircrew may affect the flying in aviation or space flight and the flying in aviation or space may induce or aggravate allergic rhinitis.

Author

Aircraft Pilots; Allergic Diseases

20000109730 Institute of Space Medico-Engineering, Beijing, China

CAT System and Its Application in Training for Manned Space Flight

Zhu, Ziu-Qing, Institute of Space Medico-Engineering, China; Chen, Dao-Mu, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; Feb. 2000; ISSN 1002-0837; Volume 13, No. 1, pp. 74-78; In Chinese; Copyright; Avail: Issuing Activity

As aerospace missions get increasingly frequent and complex, training becomes ever more critical. Training devices in all levels are demanded. Computer-Aided Training (CAT) system, because its economic, efficient and flexible, is attracting more and

more attention. In this paper, the basic factors of CAT system were discussed; the applications of CAT system in training for manned space flight were illustrated. Then we prospected further developments of CAT system.

Author

Computer Assisted Instruction; Training Simulators; Training Devices; Flight Simulators

20000105204 Old Dominion Univ., Norfolk, VA USA

Pilot Personality Profile Using the NEO-PI-R

Fitzgibbons, Amy, Old Dominion Univ., USA; Davis, Don, Old Dominion Univ., USA; [2000]; 16p; In English

Contract(s)/Grant(s): NGT1-52193

Report No.(s): ODURF-182271; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper recounts the qualitative research conducted to determine if a general personality measure would provide a personality profile for commercial aviation pilots. The researchers investigated a widely used general personality inventory, the NEO-PI-R, with 93 pilots. The results indicate that a "pilot personality" does exist. Future research and implications are discussed.

Author

Aircraft Pilots; Neuropsychiatry; Aviation Psychology; Personality; Personality Tests; Psychological Tests

20000110868 Civil Aeromedical Inst., Oklahoma City, OK USA

The Relationship Between Aviators' Home-Based Stress to Work Stress and Self-Perceived Performance *Final Report*

Fiedler, Edna R., Civil Aeromedical Inst., USA; Della Rocco, Pam S., Civil Aeromedical Inst., USA; Schroeder, David J., Civil Aeromedical Inst., USA; Nguyen, Kiet T., Civil Aeromedical Inst., USA; October 2000; 12p; In English

Contract(s)/Grant(s): AM-B-99-HRR-518

Report No.(s): DOT/FAA/AM-00/32; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper investigates the relationship between domestic-based stress and pilots' perceptions of their effectiveness in the cockpit and in the office. Despite the importance placed on the family as a source of social support, there have been few systematic studies of the relationships between pilot family life, workplace stress, and performance. As part of a larger study, 19 USA Coast Guard (USCG) helicopter pilots at two air stations completed a stress questionnaire (adapted from Cooper and Sloan, 1986), rated the importance of various coping strategies, and evaluated their own flying performance. The results of this study indicate that the effects of domestic stress carry over to the pilots' work world, directly influencing work stress and indirectly affecting pilots' perceptions of their flying performance. The positive influence of home life in mediating stress was noted when pilots were asked to rate the importance of various coping strategies. Pilots rated three aspects of home life as the most "important" factors in helping them cope with problems or stress. Thus, domestic-related issues were very important to this group of USCG pilots, suggesting the need for management to maintain awareness of how the quality of home life may affect the work environment and overall performance.

Derived from text

Aircraft Pilots; Aviation Psychology; Psychological Effects; Psychological Factors; Stress (Psychology); Pilot Performance

20000113409 Eastern Virginia Medical School, Behavioral Medicine Clinic, . Norfolk, VA USA

Stress Counter-Response Training Via Physiological Self-Regulation During Flight Simulation, 29 Jul. 1998 - 30 Jun. 2000

Palsson, Olafur S., Eastern Virginia Medical School, USA; [2000]; 10p; In English

Contract(s)/Grant(s): NCC1-310; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This study provided the first evaluation of a new training concept and technology aimed at training pilots to maintain physiological equilibrium during circumstances in an airplane cockpit. Thirty healthy subjects (16 males and 14 females) between the ages of 18 and 35 were randomized into two study groups, A and B. Subjects participated individually in a sequence of four study sessions. In the first visit, subjects were taught to operate a desktop fighter jet flight simulation program. In the three sessions that followed, subjects in group A were trained to minimize their autonomic deviation from baseline values while operating the desktop flight simulation. This was done by making their skin conductance and hand temperature deviations from baseline impair the functionality of the aircraft controls. Subjects also received auditory and visual cues about their autonomic deviation, and were instructed to keep these within pre-set limits to retain full control of the aircraft. Subjects in group B were subjected to periods of impaired aircraft functionality independent of their physiologic activity, and thus served as a control group. No statistically significant group differences were found in the flight performance scores from the three training sessions, and post-training flight performance scores of the two groups were not different. We conclude that this study did not provide clear support for this training methodology in optimizing pilot performance. However, a number of shortcomings in the current status of this training methodology may account for the lack of demonstrable training benefit to the experimental group. Suggested future modifications for research on this training methodology include: Limiting the amount of instrument impairment resulting from physiological

deviations; conducting a greater number of physiological training sessions per subject; using pre-post training performance tests which invoke a greater amount of stress in subjects; and developing a more detailed performance scoring system.

Author

Flight Simulation; Flight Stress (Biology); Psychophysiology; Pilot Performance; Autonomic Nervous System

20000114848 Massachusetts Inst. of Tech., International Center for Air Transportation, Cambridge, MA USA
Analysis of Complexity Evolution Management and Human Performance Issues in Commercial Aircraft Automation Systems Final Report, 1 Jul. 1996 - 30 Jun. 2000

Vakil, Sanjay S., Massachusetts Inst. of Tech., USA; Hansman, R. John, Massachusetts Inst. of Tech., USA; May 2000; 265p; In English

Contract(s)/Grant(s): NAG1-1857

Report No.(s): ICAT-2000-3; No Copyright; Avail: CASI; A12, Hardcopy; A03, Microfiche

Autoflight systems in the current generation of aircraft have been implicated in several recent incidents and accidents. A contributory aspect to these incidents may be the manner in which aircraft transition between differing behaviours or 'modes.' The current state of aircraft automation was investigated and the incremental development of the autoflight system was tracked through a set of aircraft to gain insight into how these systems developed. This process appears to have resulted in a system without a consistent global representation. In order to evaluate and examine autoflight systems, a 'Hybrid Automation Representation' (HAR) was developed. This representation was used to examine several specific problems known to exist in aircraft systems. Cyclomatic complexity is an analysis tool from computer science which counts the number of linearly independent paths through a program graph. This approach was extended to examine autoflight mode transitions modelled with the HAR. A survey was conducted of pilots to identify those autoflight mode transitions which airline pilots find difficult. The transitions identified in this survey were analyzed using cyclomatic complexity to gain insight into the apparent complexity of the autoflight system from the perspective of the pilot. Mode transitions which had been identified as complex by pilots were found to have a high cyclomatic complexity. Further examination was made into a set of specific problems identified in aircraft: the lack of a consistent representation of automation, concern regarding appropriate feedback from the automation, and the implications of physical limitations on the autoflight systems. Mode transitions involved in changing to and leveling at a new altitude were identified across multiple aircraft by numerous pilots. Where possible, evaluation and verification of the behaviour of these autoflight mode transitions was investigated via aircraft-specific high fidelity simulators. Three solution approaches to concerns regarding autoflight systems, and mode transitions in particular, are presented in this thesis. The first is to use training to modify pilot behaviours, or procedures to work around known problems. The second approach is to mitigate problems by enhancing feedback. The third approach is to modify the process by which automation is designed. The Operator Directed Process forces the consideration and creation of an automation model early in the design process for use as the basis of the software specification and training.

Author

Aircraft Pilots; Airline Operations; Automatic Control; Behavior; Commercial Aircraft; Feedback; Human Performance

15

MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

Includes general topics and overviews related to mathematics and computer science.

20000110541 Inter-American Univ. of Puerto Rico, School of Engineering, Bayamon, Puerto Rico

User-Interface and Educational Improvements to a Web-Based Aircraft Design Module

Withington, Jim, Inter-American Univ. of Puerto Rico, Puerto Rico; 1999 NASA - ODU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; August 2000, pp. 81; In English; See also 20000110509; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

BadWeb, or Basic Aircraft Design Web Page, is an existing Internet site developed by members of NASA Langley and Ames Research Centers. The purpose of the web page is to enhance interest and awareness in aeronautics by bringing powerful design and analysis tools in the area of aircraft design to the general public. Using the BadWeb site, users are asked to design a commercial transport aircraft that will result in the lowest ticket price for a flight between San Francisco and New York. The BadWeb site allows 13 design parameters to be modified to improve the design. The underlying computer program behind BadWeb uses many advanced and professional grade routines that have been adapted for purposes of running from a web server. Very realistic results are obtained as indicated by its current popularity among professional aircraft designers. In order that the educational mission of the project be more successfully addressed, particularly in the K-12 environment, a number of elements of the web site have been modified. Improvements include links to an expanded discussion of how the choice of parameters affects issues such as aircraft

weight, range, fuel/passenger capacity, lift and drag. by reading these links, a user can determine which of the design parameters are most important, the extent to which each could be used to improve aircraft performance, and the positive and negative design implications of each. In addition to the technical information, references to historical and modern examples of the design parameter are included. Over thirty links to photographs, videos, charts and graphs are available for users to follow and be able to visualize how the different design approaches look and behave. It is envisioned that in an educational setting such as a high school math or physics class, the information provided in this web page could serve as a strong basis for teachers' lectures or for students to follow up on and do more detailed projects or reports. Examples such as breaking the speed of sound, the history of swept wing aircraft, the jet engine or the future of aircraft design are just a few examples of the types of topics that the BadWeb page could lead students to. In addition to the information directly obtainable through the BadWeb site, links are also given to other NASA sites including the photo galleries, on-line versions of printed material and the site for ordering helpful NASA publications.

Derived from text

Aircraft Design; World Wide Web; Education; Commercial Aircraft; Human-Computer Interface

20000110377 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

MABVAP: One Step Closer to an Aerobot Mission to Mars

Kerzhanovich, V. V., Jet Propulsion Lab., California Inst. of Tech., USA; Cutts, J. A., Jet Propulsion Lab., California Inst. of Tech., USA; Bachelder, A. D., Jet Propulsion Lab., California Inst. of Tech., USA; Cameron, J. M., Jet Propulsion Lab., California Inst. of Tech., USA; Hall, J. L., Jet Propulsion Lab., California Inst. of Tech., USA; Patzold, J. D., Jet Propulsion Lab., California Inst. of Tech., USA; Quadrelli, M. B., Jet Propulsion Lab., California Inst. of Tech., USA; Yavrouian, A. H., Jet Propulsion Lab., California Inst. of Tech., USA; Cantrell, J. A., Utah State Univ., USA; Lachenmeier, T. T., GSSL, Inc., USA; Smith, M. G., Raven Industries, Inc., USA; The Fifth International Conference on Mars; July 1999; In English; See also 20000110269; CD-ROM contains the entire conference proceedings presented in PDF format; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Lighter-than-air planetary missions continued attract growing interest in Mars exploration due to unique combination of proximity to the surface and mobility that far surpasses capability of surface vehicles. Following the experience with the Sojourner rover and subsequent development of powerful rovers for Mars 2003 and 2005 missions it became clear that on Mars surface rover mobility is quite restricted. Realistic travel distances may be limited to tens of kilometers per year on relatively obstacle-free plains and a few kilometers or less on the more rugged terrains. Many areas on Mars will be inaccessible to rovers. Several concepts for a Mars aerobot (robotic balloon) mission have been pursued in the last decade. Additional information is contained in the original extended abstract.

Author

Flying Platforms; Imaging Techniques; Mars Atmosphere; Mars Exploration; Mars Surface; Microminiaturization; Robotics

20000108735 NASA Langley Research Center, Hampton, VA USA

Closed-loop Separation Control Using Oscillatory Flow Excitation

Allan, Brian G., Institute for Computer Applications in Science and Engineering, USA; Juang, Jer-Nan, NASA Langley Research Center, USA; Raney, David L., NASA Langley Research Center, USA; Seifert, Avi, Tel-Aviv Univ., Ramat-Aviv, Israel; Pack, latunia G., NASA Langley Research Center, USA; Brown, Donald E., NASA Langley Research Center, USA; August 2000; 27p; In English; Original contains color illustrations

Contract(s)/Grant(s): NAS1-97046; RTOP 505-90-52

Report No.(s): NASA/CR-2000-210324; ICASE-2000-32; NAS 1.26:210324; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Design and implementation of a digital feedback controller for a flow control experiment was performed. The experiment was conducted in a cryogenic pressurized wind tunnel on a generic separated configuration at a chord Reynolds number of 16 million and a Mach number of 0.25. The model simulates the upper surface of a 20% thick airfoil at zero angle-of-attack. A moderate favorable pressure gradient, up to 55% of the chord, is followed by a severe adverse pressure gradient which is relaxed towards the trailing edge. The turbulent separation bubble, behind the adverse pressure gradient, is then reduced by introducing oscillatory flow excitation just upstream of the point of flow separation. The degree of reduction in the separation region can be controlled by the amplitude of the oscillatory excitation. A feedback controller was designed to track a given trajectory for the desired degree of flow reattachment and to improve the transient behavior of the flow system. Closed-loop experiments demonstrated that the feedback controller was able to track step input commands and improve the transient behavior of the open-loop response.

Author

Feedback Control; Boundary Layer Separation; Boundary Layer Control; Wind Tunnel Tests; Controllers; Separated Flow; Oscillating Flow; Airfoils; Excitation

16
PHYSICS (GENERAL)

Includes general research topics related to mechanics, kinetics, magnetism, and electrodynamics.

~~200001~~12947 General Electric Co., Aircraft Engines, Cincinnati, OH USA

Development and Demonstration of Active Noise Control Concepts *Final Report*

Kraft, R., General Electric Co., USA; Hu, Z., General Electric Co., USA; Sommerfeldt, S., Brigham Young Univ., USA; Walker, B., Hersh Acoustical Engineering, Inc., USA; Hersh, A., Hersh Acoustical Engineering, Inc., USA; Luo, H., General Electric Co., USA; Spencer, M., Signal Processing Solutions, USA; Hallman, D., General Electric Co., USA; Mitchell, C., Colorado State Univ., USA; Sutliff, D., AYT Corp., USA; September 2000; 152p; In English; Original contains color illustrations

Contract(s)/Grant(s): NAS3-27720; RTOP 522-81-11

Report No.(s): NASA/CR-2000-210037; E-12235; NAS 1.26:210037; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

This report details design methods for and feasibility of an Active Noise Control (ANC) system using flush-wall-mounted sensors and actuators to reduce turbofan engine rotor-stator interaction noise. ANC concepts capable of suppressing discrete-tone spinning modes containing several cut-on radial mode were identified, developed analytically, and evaluated. Separate ANC systems that suppressed at least three radial modes in a cylindrical inlet duct and three radial modes in an exhaust annulus were developed. These designs resulted in inlet duct and exhaust duct tests that were performed at NASA on the 4-ft ANC Fan in the NASA Glenn APL facility. Effective suppression of 2-BPF spinning mode $m = 2$ tone noise was achieved over a range of fan speeds 1800 to 2450 rpm, where up to 4 radials were present. In the inlet duct, up to 12 dB reduction was obtained for 3 radial modes, and up to 4 dB was obtained with 4 radial modes. In the exhaust duct, up to 15 dB PWL reduction was obtained with either two or three radial modes present. Thus, the ability to suppress multiple radial modes for tones in both the inlet and exhaust ducts has been successfully demonstrated. Implications of ANC system design requirements on installation and system integration issues for ANC systems capable of suppressing higher order radial mode content when applied to a 767 using twin CF6 engines were evaluated analytically. The analytical results indicated an ANC system must be part of an integrated design to be effective. Derived from text

Control Theory; Noise Reduction; Turbofan Engines; Ducted Fan Engines; Aircraft Engines; Active Control; Self Adaptive Control Systems; Acoustic Ducts; Aircraft Noise; Aerodynamic Noise

19
GENERAL

Includes aeronautical, astronautical, and space science related histories, biographies, and pertinent reports too broad for categorization; histories or broad overviews of NASA programs such as Apollo, Gemini, and Mercury spacecraft, Earth Resources Technology Satellite (ERTS), and Skylab; NASA appropriations hearings.

~~200001~~14829 NASA Ames Research Center, Moffett Field, CA USA

Research and Technology, FY 1997

September 1998; 192p; In English; Original contains color illustrations

Report No.(s): NASA/TM-1998-112240; A-9810764; NAS 1.15:112240; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

This report highlights the challenging work accomplished during fiscal year 1997 by Ames research scientists, engineers, and technologists. It discusses research and technologies that enable the Information Age, that expand the frontiers of knowledge for aeronautics and space, and that help to maintain U.S. leadership in aeronautics and space research and technology development. The accomplishments are grouped into four categories based on NASA's four Strategic Enterprises: Aeronautics and Space Transportation Technology, Space Science, Human Exploration and Development of Space, and Earth Science. The primary purpose of this report is to communicate knowledge--to inform our stakeholders, customers, and partners, and the people of the USA about the scope and diversity of Ames' mission, the nature of Ames' research and technology activities, and the stimulating challenges ahead. The accomplishments cited illustrate the contributions that Ames is making to improve the quality of life for our citizens and the economic position of the USA in the world marketplace.

Author

Earth Sciences; Engineers; Research and Development; Space Transportation; Technology Utilization; Mission Planning; Aeronautics

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